5-1986

The Role of Vicarious Reinforcement for Modeled or Alternate Behavior

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THE ROLE OF VICARIOUS REINFORCEMENT
FOR MODELED OR ALTERNATE BEHAVIOR

by

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A dissertation submitted in partial fulfillment
of the requirements for the degree

of

DOCTOR OF PHILOSOPHY

in

Psychology

Approved:

UTAH STATE UNIVERSITY
Logan, Utah

1986

ACKNOWLEDGMENTS

I would like to thank Grayson Osborne for his supervision and support throughout the entire span of this project. He helped shape my private events, research, and writing. I would also like to thank my committee members: Carl Cheney for his many insightful comments and his never-ending encouragement; Richard Powers for his intriguing questions that helped focus my thinking; Ed Crossman for teaching me the programming skills necessary to conduct the research and for the resource he provided for technical assistance; Charles Johnson for his support and positive comments; Frank Ascione, whose comments at the proposal meeting helped shape the design of Experiment II; and Izar Martinez, for representing the Graduate School at the final defense.

There were many others who facilitated the completion of this dissertation. I am most appreciative of: the staff of Children's House and the Developmental Laboratory Preschools, especially Shelley Lindauer; the staff of Creative Learning Preschool, especially Bruce Kahn and June Harp; my assistants and models, who included Dennis Barrett, Brian McDonald, and Claire Brock; Mark Thornburg for rewiring the interface; Sue Galderisi and Jill Christiansen for their excellent typing; and Elliot Bonem for technical assistance and for keeping me registered.

Finally, I could not have completed this endeavor without the constant support of my wonderful wife and the support of my parents and my sister. To them I am most grateful.

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ABSTRACT

The Role of Vicarious Reinforcement
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by

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Utah State University, 1986

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Research on vicarious reinforcement has answered many questions but whether vicarious reinforcement increases the likelihood that an observer will imitate a model, as social learning theory would predict, or sets the occasion for the observer to perform an alternate response, as a discriminative stimulus interpretation of vicarious reinforcement suggests, seems to depend on (1) the setting, (2) procedure, and (3) reinforcers used. In an effort to better understand the function of vicarious reinforcement, while controlling for subjects' histories and using tangible reinforcers, 47 preschool children participated in two experiments that (1) provided an experimental history of responding on several levers, (2) provided differential reinforcement on the levers during training, and (3) assessed the effects of observing a model respond on a lever and receive tokens.

In Experiment I, 18 subjects who were trained to respond on three levers responded during an extinction period and then observed either an adult model respond on a fourth, novel lever or observed a control procedure. Only subjects who observed the model receive tokens responded on the same lever as the model during an additional extinction period. The extinction period was procedurally defined and relatively short in duration. The results of Experiment I supported social learning theory; however, imitation effects were short lived. Another experiment was conducted to evaluate more fully the extinction of the modeled behavior found in Experiment I.

In Experiment II, 29 subjects who were trained to respond on three levers responded during an extinction period and then observed an adult model in one of four modeling conditions. The subjects in this experiment were exposed to the modeled lever during training and had an extensive history of never being reinforced on the modeled lever. Only some of the subjects who observed the model receive tokens responded on the modeled lever and only for a short period of time. The results of this experiment illustrated the importance of the reinforcement history of the observer and supported previous studies which found an extinction effect for vicarious reinforcement.

Taken together, these experiments illustrate the limits of social learning theory because imitation effects were short lived and suggest certain procedures that will enhance the use of vicarious reinforcement in an applied setting.

(108 pages)

INTRODUCTION

The learning of novel behavior through observation has been well documented (e.g., Bandura, 1965; Bandura, Ross, & Ross, 1963). However, the process by which this learning takes place is subject to theoretical debate (e.g., Bandura, 1971b; Gewirtz, 1971), and the debate has generated much research (cf. Flanders, 1968; Thelen & Rennie, 1972).

Many questions involving learning novel behavior through observation have also been of interest throughout the course of history. For example, Whitehurst (1978) related that both Plato and Aristotle noted the importance of imitation to man. Earlier this century, the philosopher Tarde (1903) distinguished between various types of imitation. Early theoretical accounts of imitation postulated that imitation was instinctual (e.g., McDougall, 1908), a result of contiguity (e.g., Allport, 1924; Holt, 1931; Humphreys, 1921) or a result of specific actions receiving certain consequences (e.g., Jersild, 1933). Such theoretical discussions remained purely speculative until Miller and Dollard (1941) introduced imitation to the laboratory.

One problem in the area of observational learning has been defining the many terms used for the effects of learning through observation. Bandura (1971a) subsumed the labels "imitation" and "identification" under the term "modeling" because the latter term adopted a broader definition beyond mimicry. An observational learning effect is said to occur when observers acquire new patterns of behavior by watching the performance of others.

One current focus in the area of observational learning has been to investigate the effects of certain consequences (or lack of consequences) for one individual on the behavior of another individual who has observed those consequences. Such research has been subsumed under the label "vicarious reinforcement." This label is used, although some investigations (e.g., Paschke, Simon, & Bell, 1967) may not have dealt specifically with an increase in behavior which is a requirement in the definition of reinforcement (Skinner, 1953). Additionally, some authors (e.g., Gewirtz, 1971) have questioned the parsimony of "hyphenated-reinforcement terms," such as vicarious reinforcement, accounting for the effects more efficiently by routine conditioning concepts.

The import of vicarious reinforcement in the applied setting has been discussed by several authors (e.g., Kazdin, 1979; Ollendick & Shapiro, 1984). As Kazdin (1979) noted, providing reinforcing consequences for one individual in a group tends to improve performance of others in the group. For example, teachers and parents could strengthen the desirable behavior of children without directly reinforcing the behavior of each member of the group.

Vicarious reinforcement also has theoretical significance. In social learning theory (Bandura, 1971b, 1977), vicarious reinforcement is considered motivational and is integral to the performance of the modeled event. Gewirtz and Stingle (1968) conceptualized vicarious reinforcement as a discriminative stimulus and suggested that if an observer was reinforced less frequently for a modeled response and more frequently for alternate responses, then reinforcement provided to the model could set the occasion for alternate behaviors for the observers rather than motivate observers to imitate the model.

The discriminative stimulus conception of vicarious reinforcement is also espoused by Kazdin. In his review, Kazdin (1979) proposed that vicarious reinforcement (e.g., teacher praise) to one child may function as a discriminative stimulus for other children because vicarious reinforcement often precedes contingent reinforcement for the other children. In this situation, hearing the teacher deliver praise serves as a discriminative stimulus that direct consequences are likely to follow. In essence, it is the teacher's praise (and not praise for a specific modeled behavior) that sets the occasion for desirable behavior in the observer. There is some support for this view in the applied literature. In one classroom study, Kazdin (1973b) included a phase in which the model was praised for inattentive behavior; yet the observers, who never received praise during the study, increased their attentive behavior. This outcome runs counter to what a social learning interpretation would predict because in that theory, vicarious reinforcement motivates the observer to perform in a manner comparable to the model. Therefore, reinforcing inattentive behavior in the model should lead to an increase in inattentive behavior in the observer. However, the results of Kazdin (1973b) did not support this hypothesis. Results similar to the above study were found in a rehabilitation setting (Kazdin, 1973a) and also in a classroom where inattentive behavior by the model was reinforced at an earlier stage in the investigation (Kazdin, 1977). This latter study demonstrated that the inclusion of a phase where the observer receives direct reinforcement is not necessary to obtain an increase in attentive behavior when the model is reinforced for inattentive behavior.

The results of the above experiments lend support to the discriminative stimulus interpretation of vicarious reinforcement and contradict what a modeling or social learning interpretation would predict. However, except for an experiment by Werstlein (1978), the only reinforcer used in studies that have supported the discriminative stimulus interpretation was praise. Because it is not known what the pre-experimental histories of the subjects were in terms of praise or teacher attention, it is possible that different histories (i.e., past exposure to the contingencies of teacher attention) affected the subjects' performances in the studies. For example, it is conceivable that for the students utilized in the above studies, paying attention or on-task behavior produced a high rate of teacher attention. This history might, therefore, have affected the observer's performance in a manner differently than would have a history where subjects received teacher attention for inattentive behavior. Also, as Kazdin (1979) has noted, the interrelatedness of observer and model behavior and conspicuousness of reinforcer delivery are variables that affect vicarious effects in the classroom setting. For example, the behavior of the observer and model are interrelated because reinforcement to the model for attentive behavior may not only strengthen attentive behavior in the model but may also remove a potential reinforcer (i.e., the model's attention) from the observer for inattention. These variables may be better controlled in an experimental setting.

In a laboratory situation, the current study assessed whether vicarious reinforcement: (a) functions as a discriminative stimulus that signals availability of reinforcement for alternate behavior; (b) functions to demonstrate what specific modeled responses result in reinforcement and, thus, occasions the observer to perform these specific responses; or (c) serves different functions as a result of the experimental procedure. However, unlike the studies in applied settings, the current study provided observers with experimental histories of different schedules of reinforcement. Although brief, this provision served to equate subjects' histories in regard to the responses, reinforcers, and contingencies. After exposure to a vicarious reinforcement condition, a test phase assessed whether the observers performed the modeled response or a different response which was present in their experimental histories. The current study thereby provided an assessment of the social learning and discriminative stimulus interpretations of vicarious reinforcement under experimental laboratory conditions as opposed to a classroom.

REVIEW OF LITERATURE

The following review surveys those studies that have investigated vicarious reinforcement and those variables that have been identified as affecting the likelihood of imitation. Specifically, definitions of vicarious reinforcement, characteristics of vicarious reinforcement, methodology of vicarious reinforcement research, variables affecting imitation, research in generalized imitation, and theoretical accounts of vicarious reinforcement are reviewed.

Definitions of Vicarious Reinforcement

Several definitions of vicarious reinforcement have been articulated. Bandura (1971b) defined vicarious reinforcement as a "change in the behavior of observers as a function of witnessing the consequences accompanying the performance of others" (p. 230). Flanders (1968) defined vicarious reinforcement as "the operation of exposing O [an observer] to a procedure of presenting a reinforcing stimulus to M [a model] (i.e., a presumed or confirmed reinforcing stimulus for O) after and contingent upon a certain response by M" (p. 319). In a review of the effect of vicarious reinforcement on imitation, Thelen and Rennie (1972) adopted Flanders' definition but added the condition that the reinforcing stimulus be presented by an agent external to the model, thereby excluding private consequences such as anxiety reduction as a reinforcer. Unless otherwise stated, the term vicarious reinforcement in the present paper will most closely resemble Flanders' definition with the Thelen and Rennie adaptation.

Characteristics of Vicarious Reinforcement

Bandura (1969) noted that investigations of the relative efficacy of vicarious and direct reinforcement demonstrated that the changes exhibited by observers were of the same magnitude (Kanfer, 1965) or, under some conditions, exceeded those of subjects who received direct reinforcement (e.g., Berger, 1961). He also noted that vicarious reinforcement is influenced by variables such as intermittence (Rosenbaum & Bruning, 1966), percentage (Kanfer, 1965), and magnitude (Bruning, 1965) of reinforcement in a manner that is similar to the control of these variables on behavior that is reinforced directly.

The effect of percentage of vicarious reinforcement on behavior has been investigated by several authors. Lewis and Duncan (1958) had subjects respond on a modified slot machine and varied percentage of reinforcement (25% or 100%), whether subjects viewed an experimenter play, and whether subjects themselves were rewarded during acquisition. Total number of plays per subject during extinction was calculated, and results revealed that a partial reinforcement effect occurred in those conditions in which subjects received yoked reinforcement when the experimenter was rewarded during acquisition. Berger and Johansson (1968) also found greater resistance to extinction in a 25% schedule than a 100% schedule of reinforcement to the model but demonstrated that subjects who observed an emotional model (i.e., one who expressed pleasure on rewarded trials and displeasure on nonrewarded trials) showed greater resistance to extinction regardless of schedule. Similarly, Hamilton (1970) found greater resistance to extinction in a 50% reinforcement condition than in a 100% reinforcement condition regardless of whether subjects had received direct reinforcement or whether subjects had observed a model reinforced. Hamilton also demonstrated that such effects occurred one week later in a spontaneous recovery phase.

Further evidence for the partial reinforcement effect in vicarious reinforcement was found in Berger (1971) and Paulus and Seta (1975), who used a 25% and 75% level of reinforcement. Both studies also demonstrated the importance of the similarity of beliefs between model and observer by informing subjects that the models had either similar or dissimilar beliefs in regard to the experimental task or in regard to general social issues. Feist (1974/1975), using variable ratio 6 and continuous reinforcement schedules in a bar press task, also demonstrated a partial reinforcement effect but noted that instructions to "press fast for a long time" and "press slow and stop soon" were a more potent variable that controlled responding in extinction.

McGinley (1970) investigated whether a reinforcer could be conditioned through vicarious reinforcement. Task-learning subjects received reinforcement paired with a blue or red light and were observed by other subjects. McGinley then assessed the functionality of the colored lights as reinforcers for subjects who performed and subjects who observed and found that direct reinforcement was more effective for the establishment of a conditioned reinforcer than vicarious reinforcement. However, Arenson (1976) found that subjects who observed a light paired with candy delivered as a reinforcer for a model's performance increased the subjects' performance when the light was used as a reinforcer, thereby demonstrating that a neutral stimulus could become a conditioned reinforcer through vicarious reinforcement.

In a series of investigations, Marston and his associates (Kanfer &

Marston, 1963; Marston, 1964, 1965, 1966) demonstrated that vicarious reinforcement significantly facilitated learning, with direct reinforcement showing no additional effects, and that vicarious and direct reinforcement may have different roles in acquisition and extinction. For example, Marston (1964) had undergraduates listen to an audio-recorded voice receive reinforcement ("good") for saying correct responses (i.e., human nouns such as "man"). During acquisition, subjects alternated responding with the audiotape and increased their use of human nouns without receiving direct reinforcement. During extinction, subjects were exposed to one of five model conditions: high rate of correct responses with vicarious reinforcement, low rate of correct responses with vicarious reinforcement, high rate of correct responses without vicarious reinforcement, low rate of correct responses without vicarious reinforcement, or no model. Results indicated that in extinction, the rate of correct responses by the model (i.e., the recorded voice) was found to be a critical variable in increasing the frequency of correct responses, whereas vicarious reinforcement did not increase correct responses. Additionally, Phillips (1968a) found that direct reinforcement was more effective than vicarious reinforcement in increasing critical responses in a verbal conditioning study in acquisition as well as extinction. Phillips (1969) also demonstrated that learning by direct reinforcement was impeded by exposure to noncontingent vicarious reinforcement.

In a study that compared performances in extinction, Braun (1972) varied the schedule of reinforcement (20% and 80%), the type of reinforcement (direct and vicarious), and the nature of the model's verbal cues (relevant to the task and persistent, and irrelevant to the task and nonpersistent) during acquisition. Subjects were requested to express their expectancy of winning prior to each trial and then pressed one of four response buttons available on a slot machine. Dependent variables were resistance to extinction (total responses, total imitative responses, and total time), response rate during extinction, and expectancy of reinforcement during extinction (i.e., how sure subjects were of a payoff). Results showed that the low-percentage schedule of reinforcement to the model (i.e., 20%) produced the greater resistance to extinction as measured by all three indices. The low-percentage schedule produced greater mean rates of responding than the high-percentage schedule regardless of type of reinforcement. Vicarious reinforcement produced greater overall rates of responding than did comparable direct reinforcement procedures in extinction, reflecting the response rates of acquisition. However, the possibility of bias was mentioned because response rates of the model were not controlled. It was, therefore, possible that had models responded at a lower rate, observers would have also.

Borden (1973/1974) investigated the effects of schedules of direct and vicarious reinforcement and amount of acquisition training on a bar press response with second grade students. Using six levels of reinforcement (8-1/3% to 100%) and 12, 60, or 300 trials in acquisition training, Borden assessed bar pressing in extinction with a 10-minute time limit. Resistance to extinction was measured by the number of responses to extinction, seconds to extinction, and rate of responding during extinction. The results showed that: (a) partial schedules (i.e., less than 100%) of direct and vicarious reinforcement led to greater frequency, duration, and rate of responding; (b) subjects who observed models tended to imitate their rate and duration of responding, suggesting that observers learned the temporal topography of the response; and (c) rate of responding during extinction was a function of the number of acquisition trials (with longer acquisition producing faster rates). No effect of acquisition training was found in time and trials to extinction. Borden suggested that measures of resistance to extinction are not always consistent and that investigators should discuss results in terms of the specific dependent variables (e.g., response rate) instead of the term "resistance to extinction."

In summary, as in direct reinforcement, vicarious reinforcement has been used to produce a partial reinforcement effect (e.g., Hamilton, 1970), conditioned reinforcement (e.g., Arenson, 1976), and an increase in critical responses during acquisition (e.g., Marston, 1964). The effects of both direct and vicarious reinforcement in extinction have been influenced by the number of acquisition trials (Borden, 1973/1974), although vicarious reinforcement has sometimes produced greater overall rates of responding in extinction (e.g., Braun, 1972).

Methods Used in Vicarious Reinforcement Studies

The methodology employed by investigators of vicarious reinforcement is important for two reasons: (1) certain procedures have yielded greater vicarious effects, and (2) procedural differences have helped to clarify definitions of vicarious reinforcement.

Addressing the first of these issues, Thelen and Rennie (1972) reported that the effect of vicarious reinforcement was greatly enhanced if: (a) the experimental task was presented on an alternate-trial basis, (b) the experimenter (and/or the person who rewarded the model) was present during testing, and (c) the subjects expected to perform the modeled task after observing the model.

Alternate Versus Nonalternate Trials

Thelen and Rennie (1972) described alternate-trial studies as those investigations where subjects alternated responding with the model during the observation phase. For example, in a verbal conditioning study, Kanfer and Marston (1963) required subjects to listen to a series of responses (i.e., words) by other subjects (actually prerecorded) and then respond. The subjects listened and then were asked to say words for a series of trials. According to Thelen and Rennie (1972), experimental groups in three alternate-trial studies (Clark, 1965; Kanfer & Marston, 1963; Marston, 1966) demonstrated positive vicarious reinforcement effects when compared to a model no-consequence control, whereas experimental groups in three alternate-trial studies did not (Marston, 1964; Phillips, 1968a, 1968b). However, some of the vicarious effects might have resulted from direct reinforcement to the subjects during acquisition.

Nonalternate-trial studies were described as those investigations that exposed subjects to the entire sequence of modeled behavior before the subjects had an opportunity to respond. For example, Akamatsu and Thelen (1971) had subjects view a videotape of a model performing a particular sequence of button pressing and then allowed subjects an opportunity to perform. According to Thelen and Rennie (1972), only seven of the 20 studies reviewed with a nonalternate-trial procedure (Bandura, Grusec, & Menlove, 1967; Hamilton, Thompson, & White, 1970; Kelly, 1966; Liebert & Fernandez, 1970a, 1970b; Marlatt, 1970; Marlowe, Breecher, Cook, & Doob, 1964) demonstrated that vicarious reinforcement increased imitation over a control condition, and 13 studies failed to demonstrate an effect (Akamatsu & Thelen, 1971; Bandura, 1962, 1965; Ditrichs, Simon, & Greene, 1967; Dubanoski, 1967; Elliot & Vasta, 1970; Flanders & Thistlewaite, 1970; Marlatt, Jacobson, Johnson, & Morrice, 1970; Rosekrans, 1967; Thelen, 1969; Thelen & Soltz, 1969; Walters & Parke, 1964; Walters, Parke, & Cane, 1965). Therefore, a methodology that employs an alternate-trial design appears slightly more likely to produce vicarious effects. Several alternate-trial studies published after Thelen and Rennie's review also support this conclusion (e.g., Lyons & Levine, 1978; Paulus & Seta, 1975).

Examiner Presence

Presence of the examiner was also mentioned by Thelen and Rennie (1972) as an important variable that enhanced imitation, although presence of the model was not critical. Five studies (Bandura, 1965; Elliot & Vasta, 1970; Thelen & Soltz, 1969; Walters & Parke, 1964; Walters et al., 1965) using a nonalternate-trial design where the experimenter was not present or presumed not to be present failed to demonstrate vicarious reinforcement effects, and only one study (Bandura et al., 1967) demonstrated such an effect. In those studies where the examiner was present or presumed to be present, six of 13 studies (Hamilton et al., 1970; Kelly, 1966; Liebert & Fernandez, 1970a, 1970b; Marlatt, 1970; Marlowe et al., 1964) demonstrated vicarious reinforcement effects. The person who reinforced the model was also present or presumed to be present in these six studies. However, using a videotape of a hand performing responses and an automatic token dispenser, Anderson (1979/1980) demonstrated that imitation could be established and maintained without the presence of the experimenter when imitation was periodically reinforced. In most studies, however, presence of the examiner appeared to increase the likelihood of vicarious effects.

Expectancy or Instructions Regarding Performance

Although not specifically tested in the studies reviewed by Thelen and Rennie (1972), expectancy to perform was also cited as a potentially critical variable. Of the seven nonalternate-design studies that found vicarious reinforcement effects, most were designed to produce a clear expectancy for the subject to perform after observing the model. For example, Bandura et al. (1967) told subjects that the model was also a subject who would take his turn first and found vicarious reinforcement effects, whereas Akamatsu and Thelen (1971) told subjects nothing about what their task would be after observing the model and did not find vicarious reinforcement effects. Therefore, studies that produce expectancy to perform after the model also may enhance vicarious reinforcement.

Implicit Punishment

The methodology of vicarious reinforcement studies also helps to clarify procedural definitions as well as address theoretical issues. For example, Ollendick and his colleagues (Ollendick, Dailey, & Shapiro, 1983; Ollendick & Shapiro, 1984; Ollendick, Shapiro, & Barrett, 1982) demonstrated that vicarious reinforcement may sometimes have effects that neither social learning theory nor a discriminative stimulus interpretation predicts. Using dyads of normal and severely disturbed hospitalized children, Ollendick et al. (1982) demonstrated that observers initially increased performance on a puzzle task when the other subject in the dyad received praise, but the performance of the observers deteriorated as praise continued to the other subject. Ollendick et al. offered an extinction hypothesis in which subsequent decrements in performance were due to the extended absence of direct reinforcement. Ollendick et al. (1983) replicated the earlier findings and demonstrated that the decrement in performance by the observing child was quickly reversed by intermittent direct reinforcement to the observer. Ollendick and Shapiro (1984) demonstrated that the detrimental effects of observing another subject in a dyad receive reinforcement for an extended period of time when both the observer and the other subject were engaged in the same activity were more pronounced in older children. The effects were not a function of the subject's sex.

Taken together, the results of the studies by Ollendick and his colleagues support an "implicit punishment" observation made by Sechrest (1963), who also found detrimental performance in the observing child. Sechrest suggested that the observing child was implicitly punished because he or she had performed in the same manner as the reinforced child but did not receive direct reinforcement. Sechrest also suggested that when an observer receives no attention but observes a model receive "negative reinforcement" (actually a functional punisher for the model), the observer is implicitly reinforced. According to Sechrest, these "implicit" effects are most likely to be observed in small-group, competitive situations where participants are engaged in similar tasks. The results of Ollendick and his colleagues and Sechrest raise concern about vicarious reinforcement in applied settings, especially in small groups, and have theoretical implications for both the Bandura and Kazdin interpretations of vicarious reinforcement. However, Bandura (1971b) has distinguished between implicit reinforcement (and punishment) and vicarious reinforcement. Because the topic of this review is vicarious reinforcement, Bandura's distinction is discussed as it applies to those situations where a model receives positive reinforcement. According to Bandura, an important distinction is that in vicarious reinforcement, observers do not perform any modeled responses during the modeling period and, therefore, the model's outcomes have no immediate personal consequences for the observers (i.e., the observer's behavior is neither directly reinforced nor punished). In implicit punishment, however, individuals perform responses that are explicitly reinforced in some members and implicitly punished (not reinforced) in others. For example, if only one member of a dyad is praised, then only he/she receives direct reinforcement and the other may be "punished implicitly." Note that in this situation, observers have an opportunity to perform the modeled response during the modeling period. When the same performances are praised in one case and ignored in the other, the ignored person is exposed to immediate direct consequences to his/her own behavior as well as observed outcomes. In the case of implicit punishment, the ignored person is more likely affected by the direct consequence of his/her behavior not being reinforced and, therefore, does not follow the model.

Bandura's distinction is useful in an experimental situation and can be used as a procedural definition for vicarious reinforcement. However, in many applied settings it may not be possible or desirable to prevent observers from performing the reinforced response of the model while the model is performing the response.

Variables Affecting Imitation

Model Characteristics

In the vast literature on imitation, several variables have been investigated regarding characteristics of the model. In a review of imitation, Flanders (1968) concluded that models who have high status were more highly imitated than low-status models but that the effects of models' nurturance and sex were more equivocal. Garrett and Cunningham (1974) found no significant effects of the sex of the model but found an interaction effect and more imitation when the model and subject were the same sex.

Similarity of the model to the subject (for example, in terms of background or interests) has also been important to imitation. Rosekrans (1967) and Rickard and Lattal (1967) found that imitation was enhanced when subjects were told that the models were similar to them. Rosekrans (1967) found greater imitation in pre-adolescent subjects who were told that the model (filmed) was similar to them in terms of background, group membership, skills, and interests. Rickard and Lattal (1967) found that college students were more likely to emit critical verbal responses that were reinforced on audiotape if subjects were told that the other voice was that of another college coed as opposed to a mentally retarded girl.

Competence of the model increases imitation (Finch, Lloyd, Frerking, & Rickard, 1973). However, Kuznicki and Greenfeld (1977) demonstrated that by directly reinforcing matching, model characteristics such as competence, status, attractiveness, and prestige were not necessary to obtain matching behavior. Fisher and Harris (1976) found that a presumed stigma (an eye patch), friendliness, and affect of the model did not increase imitation.

In summary, status and competence of the model enhanced imitation as well as when subjects were told that the model was similar to them. The effects of models' nurturance and sex, however, were more equivocal.

Observer Characteristics

The age of the subject has been investigated as a potential variable that influences the likelihood of imitation. Levy, McClinton, Rabinowitz, and Wolkin (1974) found that second grade children were more likely to imitate an adult female model than college students but found no difference between preschool children, second, fourth, and sixth grade children.

Phillips, Bentson, and Blaney (1969a, 1969b) found no significant increase in imitation when models and subjects were the same sex but found that females tended to imitate either sex model more than males.

Thelen and Soltz (1969) found that black children from a low socioeconomic class imitated a white model less than white children and speculated that the black children who served as subjects had a history of being punished for imitating a white adult male initiating aggression. On the other hand Liebert, Sobol, and Copeman (1972) found that race was not an important variable, and Turner and Forehand (1976) found interaction effects between deprived children and the race of the model/experimenter.

Lyons and Levine (1978) found that preschool children who were rated high on responsiveness to information imitated more than those subjects who were rated low on responsiveness to information.

Grossman (1977/1978) studied the effects of verbal and nonverbal vicarious reinforcement, grade, and sex of the observer on imitation. When the model received nonverbal reinforcement (i.e., a smile and nod), fourth grade students were more likely to imitate than second grade students, whereas second grade students were more likely to imitate if the model received verbal reinforcement (i.e., "great"). Female subjects were more likely to imitate modeled responses after observing the model receive nonverbal or no reinforcement.

In a review of observer characteristics on imitation, Akamatsu and Thelen (1974) concluded that less competent subjects were more likely to imitate than more competent subjects if subject and model tasks were similar, and that subjects in the state of physiological arousal were more likely to imitate than subjects who were not. No relations were found between self-esteem and imitation or personality measures (e.g., MMPI) and imitation. Akamatsu and Thelen (1974) concluded that the evidence in regard to the relations among the need for approval, dependency, anxiety, and imitation was equivocal.

History of the Observer

History of the observer has also been identified as an important variable that affects imitation of a model. Oliver, Acker, and Oliver (1977) provided an experimental history of reinforcement for following nonimitative instructions by an adult. Subjects who were given this history were subsequently more likely to imitate this adult during nonreinforced trials than subjects without such a history. Durrell and Weisberg (1975) also demonstrated the importance of the history of an observer with a particular model by finding increased imitation among those subjects who had been exposed to the model who had previously reinforced the subject's correct matching response.

Osborne and Duus (1979) demonstrated the importance of a particular experimental history on imitation of an alternate response. Observing a model receive reinforcement for matching a videotaped response was sufficient for subjects to follow the model when the model emitted a dissimilar or alternate response. On the other hand, observing a model receive no reinforcement for matching was sufficient for subjects not to follow a model in performing a dissimilar or alternate response.

Draper (1976/1977) demonstrated an interaction between history of the observer and modeled behavior. For one group, an alternative response (a toggle switch) was reinforced, and for two other groups the alternative response was not reinforced. Subjects with a history of reinforcement on the alternative response were less likely to imitate a nonreinforced response of a model (a filmed hand movement on a lever) when the alternative response was present. Subjects without such a history ceased emitting unreinforced imitative responding and began emitting a reinforced alternative that was novel for the subjects but had been reinforced in the model. Therefore, presently controlling variables were more influential on the latter subjects than those subjects who had a history of reinforcement with the alternate response.

In summary, the data clearly indicate that subjects' history, especially relative to the model, is an important variable that influences the likelihood of imitative behavior.

Generalized Imitation

Several of the studies cited above (e.g., Draper, 1976/1977; Oliver et al., 1977) have investigated the effects of observing a model perform several responses in which one response is never reinforced. Baer and Sherman (1964) reinforced three imitative responses (head nodding, mouthing, strange verbalizations) by a puppet but did not reinforce a fourth response (bar pressing). Subjects imitated the fourth response as long as the other responses continued to be reinforced. This result provoked a good deal of theoretical discussion because subjects should have extinguished responding on the fourth response because it was never reinforced. Instead, imitation was "generalized" to the nonreinforced response.

Several theoretical accounts were proposed to explain generalized imitation. The first of these accounts was postulated by Baer and his colleagues (Baer, Peterson, & Sherman, 1967; Baer & Sherman, 1964). They hypothesized that similarity between behaviors of the model and the subject was a functional stimulus dimension. Because imitative behavior was developed through direct reinforcement, similarity becomes associated with reinforcement and may become a conditioned reinforcer. However, some studies (e.g., Martin, 1971; Peterson, 1968) have illustrated that nonreinforced nonimitative behavior could be maintained without extrinsic reinforcement when interspersed among reinforced imitations. This finding runs counter to the conditioned reinforcement or similarity hypothesis because nonimitative behavior was dissimilar to imitative behavior, yet the nonimitative behavior was maintained.

Gewirtz (1971) and Gewirtz and Stingle (1968) hypothesized that generalized imitation represented a functional response class that contained a potentially unlimited number of responses. They postulated that the paradigm was analagous to conditional discrimination learning where the subject matches the comparison stimulus (i.e., the model's behavior) from an array of responses in his/her repertoire, and he/she is intermittently reinforced.

Bandura (1969) proposed a discrimination hypothesis that would account for generalized imitation which he viewed as determined in part by the laboratory procedure used. Because generalized imitation procedures usually involved responses emitted by the same model, in the same setting, during the same period of time, subjects may have failed to discriminate between reinforced and nonreinforced trials. However, experiments by Steinman (1970a) illustrated that nonreinforced responses were imitated when no reinforced alternative was available, but subjects reliably discriminated nonreinforced responses and performed a reinforced alternative in a choice procedure.

A fourth and more viable account of generalized imitation can be subsumed under the term "social control." Bufford (1971) found that the instruction "say" in the initial trials of a verbal conditioning study led to performing reinforced and nonreinforced responses with equal frequency. He speculated that the instruction "say" functioned as a setting event (Bijou & Baer, 1961) because its effect persevered over extended periods even when it was not repeated before each trial. Steinman (1970b) also demonstrated the importance of instructions by illustrating that subjects will continue to perform nonreinforced responses unless specifically told not to perform the responses that do not result in reinforcement. The controlling effects of instructions were also demonstrated in studies that investigated extinction of generalized imitation (Waxler & Yarrow, 1970), methods used in assessing generalized imitation (Steinman & Boyce, 1971), and generalized imitation with severely retarded children (Martin, 1971, 1972).

Another aspect of the social control account is the effect of the presence of the experimenter. Peterson and Whitehurst (1971) varied whether or not the experimenter was present immediately after he modeled the behavior. They found that imitative performance decreased if the experimenter left the room after performing a demonstration.

A series of experiments conducted at Utah State University also investigated variables that affect generalized imitation. Anderson (1979/1980) manipulated the presence of the examiner, instructions to "do that," and the reinforcement contingency. Using a videotape of hand movements (lift, pull, depress, push) displayed on a video monitor, a token dispenser, and a four-lever apparatus, Anderson demonstrated that generalized imitation could be produced and maintained in the absence of an experimenter and "do that" instructions provided differential reinforcement was available. Anderson also demonstrated that instructions given before sessions could override the effects of reinforcers and influence behavior even in the absence of an experimenter.

Osborne and Duus (1979) used the same apparatus and video equipment to investigate the multiple sources of controlling stimuli in imitation, including the effects of the model, on a task that required subjects to observe the model and match the stimulus presentation on the videoscreen (i.e., the hand movement). Models received coins for either matching three of four lever responses or, in some cases, for emitting an alternate response. When it was the subjects' turn to respond, the subjects correctly matched the lever responses to the videotaped stimuli when coins were contingent upon matching but also followed the model and emitted a dissimilar "matching" response (i.e., an alternate response) even though the response was reinforced neither for the model nor the subject. The authors concluded that in this matching study, the controlling variables were antecendent in nature.

As mentioned earlier, Draper (1976/1977) demonstrated the interaction effects of reinforcement history of the observer and modeled behavior. Using the same apparatus and video equipment as Anderson (1979/1980) and Osborne and Duus (1979), Draper (1976/1977) conducted generalized imitation experiments and found that social control variables (e.g., examiner's presence) could be attenuated when an alternate response that had been reinforced previously was available during trials where following the model's response was not reinforced.

In summary, it appears that variables such as reinforcement history and social controls such as instructions exert much control over generalized imitation. However, generalized imitation studies usually involve subjects observing a series of modeled responses, reinforcement for performing some of the modeled responses, and measuring the imitation of nonreinforced responses. Vicarious reinforcement studies, on the other hand, usually involve observing the reinforcement of a model on a particular response, little or no direct reinforcement for the subjects, and measuring the imitation of the modeled response. The apparatus utilized in the Utah State experiments was useful in evaluating theoretical accounts and identifying controlling variables in generalized imitation. After some modification, it was used to evaluate theoretical accounts of vicarious reinforcement in the experiments to follow.

Theoretical Accounts of Vicarious Reinforcement

There are several theoretical analyses of vicarious reinforcement. For example, an informational analysis of modeling (Allen & Liebert, 1969; Liebert & Fernandez, 1970a) postulates that vicarious consequences "inform" the observer that performance of the modeled behavior can cause reactions from others and further "inform" the observer of the direction of the reactions (i.e., desirable or undesirable). Vicarious consequences are said to permit the observer to infer the outcomes he/she will receive for similar performances.

In social learning theory (Bandura, 1971b, 1977), vicarious reinforcement is considered to be a motivational process that is integral to the performance of the modeled event and may operate through several different mechanisms to produce change in the observer. As outlined by Bandura (1977), vicarious reinforcement has an "informative function" because response outcomes experienced by other people convey information to observers about behavior that is likely to meet with approval or disapproval. According to Bandura (1971b), information gained from observed outcomes is particularly influential when ambiguity exists regarding what actions are permissible or punishable and where the observer believes that the model's contingencies apply to himself/herself as well. Although mostly a cognitive theory like Allen and Liebert (1969), Bandura (1977) expanded upon the functions of vicarious reinforcement and stated that vicarious reinforcement can also serve other functions. For instance, he stated that observing others receive reinforcement can function also as a motivator by arousing expectations that the observers will receive similar benefits for comparable performance. Moreover, arousal can be vicariously elicited or extinguished; therefore, vicarious reinforcment is said to have an "emotional-learning function." Vicarious reinforcement is also said to have a "valuation function," according to Bandura, because personal values of observers can be reshaped and pre-existing ones altered by the way in which modeled behavior is reinforced and what was termed an "influenceability" function because observers also see the way in which models respond to the reinforcement.

As noted by Yando, Seitz, and Zigler (1978), Bandura makes the distinction between acquisition and performance and states that vicarious reinforcement is not necessary for acquisition. Liebert and his colleagues have argued, on the other hand, that vicarious consequences can affect acquisition. Therefore, in evaluating the role of vicarious reinforcement relative to social learning theory, one must assess its role in the performance of imitative behavior.

Another view of vicarious reinforcement has been stated by Gewirtz and Stingle (1968) and Gewirtz (1971). They suggested that responses by an observer that are similar to those for which a model is reinforced are likely to be extrinsically reinforced in the same setting whether emitted independently or matched to a model's response. Gewirtz and Stingle conceptualized vicarious reinforcement as a discriminative stimulus or cue and suggested that if an observer was reinforced less frequently for a modeled response or more frequently for alternate responses, then reinforcement to the model could serve as a discriminative stimulus for alternate behaviors. Such a conceptualization would account for an early finding by Miller and Dollard (1941) in which children either found candy under the same box as the model or the opposite box. The model's behavior functioned as a cue and set the occasion for imitation (going to the same box as the model) or nonimitation (going to the other box).

Whitehurst (1978) noted that the discriminative stimulus hypothesis suggests specific histories that might result in a variety of vicarious consequence effects. It is, therefore, historical and testable. He continued that the informational analysis of vicarious reinforcement is not testable because it has developed no means independent of the response of the observer to assess the information the observer has gained.

In a study designed to test the Gewirtz (1971) hypothesis, Rice (1976) postulated that if vicarious reinforcement functions only as a discriminative cue, then it would be as easy for a naive subject to learn to imitate a punished model and to counterimitate (i.e., choose the opposite response from the model in a two-choice situation) a rewarded model as to learn to counterimitate a punished model and to imitate a rewarded model. Children (aged 2.5 to 5 years) performed a two-choice discrimination problem in which a puppet model and subject responded alternately. During the first phase, the model was sometimes rewarded and sometimes punished. The subjects' consequences were not contingent upon the accuracy of their responses. Subjects who showed no responsiveness to vicarious reinforcement were assigned to either a natural (i.e., reward for imitation when the model was rewarded) or reversed-consequences condition. Model conditions were reward, punishment, or mixed reward and punishment. Significantly fewer errors occurred in the natural condition than in the reversed condition (i.e., when the subject was rewarded for counterimitation when the model was rewarded). The results of this study, therefore, did not support the

Gewirtz hypothesis.

As noted earlier, the discriminative stimulus interpretation of vicarious reinforcement has received support in the applied literature. Kazdin (1973b) exposed two pairs of mentally retarded students to three reinforcement phases: verbal praise for attentive behavior (to one student in each pair), verbal praise for inattentive behavior, and a reinstated condition of verbal praise for attentive behavior. The results demonstrated a high percentage of attentive behavior in all reinforcement conditions for the observers, although the percentage of attentive behavior sharply decreased for the model when that person was directly reinforced for inattentive behavior. Therefore, the performance of the observer in the second phase did not match the model, indicating that, in this particular phase, vicarious reinforcement served as a discriminative stimulus for alternate behavior. Kazdin (1973a) found similar results in a rehabilitation setting where, after reinforcement for fast work, the model was praised for slow work, yet the observer increased her work speed. The same results were obtained for another pair of male subjects. Kazdin (1977) had a subject observe a peer praised for inattentive behavior immediately after a baseline phase, thereby interrupting an experimental history of praise for attentive behavior before this experimental condition. The observer still increased his percentage of attentive behavior.

More recently, Werstlein (1978) assessed the effects of direct and vicarious reinforcement in improving performance on math problems and attentive behavior. In the first experiment, praise alone delivered vicariously after a history of directly receiving praise or observing others receive praise was not effective in increasing performance or attention. However, the results of the second experiment, where praise was combined with a material reinforcer (pencil and sharpener), demonstrated an improvement in academic performance as the result of vicarious reinforcement but only after a direct reinforcement phase. Werstlein (1978) concluded that a discriminative stimulus interpretation of vicarious reinforcement best fit the obtained results.

Summary

The above survey of the literature has revealed some disagreement of definition (Bandura, 1971b; Flanders, 1968) and procedures (Bandura, 1971b; Ollendick et al., 1983) for vicarious reinforcement, although several properties of vicarious reinforcement have been investigated. These properties include a partial reinforcement effect as assessed by resistance to extinction (e.g., Hamilton, 1970), effectiveness for establishing a conditioned reinforcer (e.g., Arenson, 1976), and the facilitation of acquisition (e.g., Marston, 1965).

When vicarious reinforcement was used as a means of producing a response by an observer that was similar to the behavior of the model receiving direct reinforcement, the production of such a response was demonstrated to be greatly enhanced if the procedures employed were alternate trial in design (e.g., Kanfer & Marston, 1963), allowed the examiner to be present during the observer's performance (Hamilton et al., 1970), or produced an expectancy for the observer to perform (e.g, Bandura et al., 1967). Imitation of the modeled behavior was also enhanced if the model was high in status (Flanders, 1968), similar to the subject (e.g., Rosekrans, 1967), and competent (e.g., Finch et al., 1973), although which subjects' characteristics enhanced imitation were more equivocal (Akamatsu & Thelen, 1974). The particular history of the observer, however, affected imitation. Following the model was enhanced if the subjects had a history of following instructions with the model (Oliver et al., 1977) or had a history of observing the model receive reinforcement for matching even if the model emitted a dissimilar or nonmatching response (Osborne & Duus, 1979). Generalized imitation studies also demonstrated that variables such as instructions (e.g., Bufford, 1971), presence of the examiner (e.g., Peterson & Whitehurst, 1971), and a combination of both can affect imitation (e.g., Anderson, 1979/1980).

Although demonstrating what variables can affect vicarious reinforcement is useful and integral to those wishing to study vicarious reinforcement, a more interesting and, perhaps, more difficult task is assessing the process by which vicarious reinforcement effects change in the behavior of the observer. Given the conditions of an experimental setting, tangible reinforcers, and an experimental history of alternate responses, is it the case that the behavior or response topography of the model is critical to changing the behavior of the observer, as Bandura (1977) would suggest, or is it the case that vicarious reinforcement serves as a discriminative stimulus that signals availability of reinforcement for a response in the observer's history, irrespective of the behavior of the model, as Kazdin (1979) would suggest? This is the research question the present study examines.

STATEMENT OF THE PROBLEM

Research on vicarious reinforcement has answered many questions, especially regarding variables that enhance its effectiveness. However, it is not clear by what process vicarious reinforcement effects change in the behavior of the observer.

Social learning theory (Bandura, 1971b, 1977) considers vicarious reinforcement a motivational process. According to this view, an observer views a model who receives reinforcement for a particular response, and the observer is motivated to respond in a similar fashion.

A discriminative stimulus interpretation (Gewirtz, 1971; Kazdin, 1979) considers vicarious reinforcement a stimulus that precedes direct reinforcement. According to this view, an observer views a model receive reinforcement, and the observer then responds in a way that was previously directly reinforced. Note that in this interpretation, the specific behavior of the model is not important. Also, because vicarious reinforcement is considered discriminative, some period of reinforcement unavailability in the absence of vicarious reinforcement is assumed.

Besides theoretical significance, identifying the process by which vicarious reinforcement operates does have import for applied settings. Behavior management in the classroom is but one area where the efficiency of not reinforcing the behavior of everyone in the group is obvious. Vicarious reinforcement can also be instrumental in effecting change in rehabilitation settings, group therapy, and in the home. However, it is critical to know if the particular behavior (i.e., the behavior to be increased in the observer) needs to be reinforced in the model or if vicarious reinforcement by itself will increase the probability of a particular behavior by the observers and, if vicarious reinforcement does lead to an increase in an alternate behavior, under what conditions this will occur.

The discriminative stimulus interpretation has received most of its support from the applied literature (Kazdin, 1973a, 1973b, 1979). However, as previously mentioned, the almost exclusive use of praise or attention as the reinforcer in these studies may not adequately account for the history of the subjects in regard to this reinforcer and may have influenced the results.

Therefore, the problem at hand is to investigate in a laboratory setting the effects of vicarious reinforcement on the behavior of an observer who has an experimental history of tangible reinforcement on an alternate or nonmodeled response. The investigation should assess: (1) whether the observer follows the model; (2) whether the observer performs an alternate response; (3) if the observer performs an alternate response, which alternate responses are performed; and (4) if the observer performs an alternate response, under what conditions is the response performed.

A laboratory procedure was devised and implemented in which subjects were specifically trained and several different responses were tangibly reinforced. Subjects in a later phase observed a model perform a previously untrained response and then were given the opportunity to perform the trained or modeled responses. A social learning interpretation of vicarious reinforcement would be supported if subjects performed the modeled response. A discriminative stimulus interpretation would be supported if subjects did not follow the model but rather performed one of the previously trained responses. In the latter case, the operation of the model receiving contingent reinforcement would set the occasion for an alternate response that was previously directly reinforced.

The laboratory procedure was implemented to ascertain the proper procedures to assess whether a social learning or discriminative stimulus interpretation of vicarious reinforcement is supported when subjects are given a specific experimental history and responses are tangibly reinforced. Although the present studies are similar to previous research in that they use a similar apparatus (e.g., Anderson, 1979/1980) and recognize the control exerted by a subject's history (e.g., Draper, 1976/1977), they are distinctive from generalized imitation studies because they investigate the effect of observing one reinforced response of a model. Additionally, the present studies are distinctive from applied studies that have investigated vicarious reinforcement because they provide for known experimental histories with the measured responses instead of assuming these histories post hoc.

EXPERIMENT I

Experiment I had two major purposes. The initial portion of the experiment, hereafter called Experiment Ia, functioned to demonstrate the discriminability of the training responses that comprised the subjects' experimental history and the respective schedules of reinforcement of the training responses in order to insure that there was no preference for a particular response irrespective of schedule. Fixed ratios were chosen as the training schedules because such ratios are typically more discriminable by human subjects than variable or temporal schedules, and because human subjects usually demonstrate a preference for the ratio with the smallest requirement (Weiner, 1966, 1967). The second portion of Experiment I, hereafter called Experiment Ib, focused upon the critical question of the effects of subjects observing a model receive reinforcement after a history of reinforcement on alternate responses. Experiment Ib incorporated the results of Experiment Ia by combining the data of new subjects with the data from Experiment Ia to address the experimental hypothesis.

Experiment Ia Method

Subjects

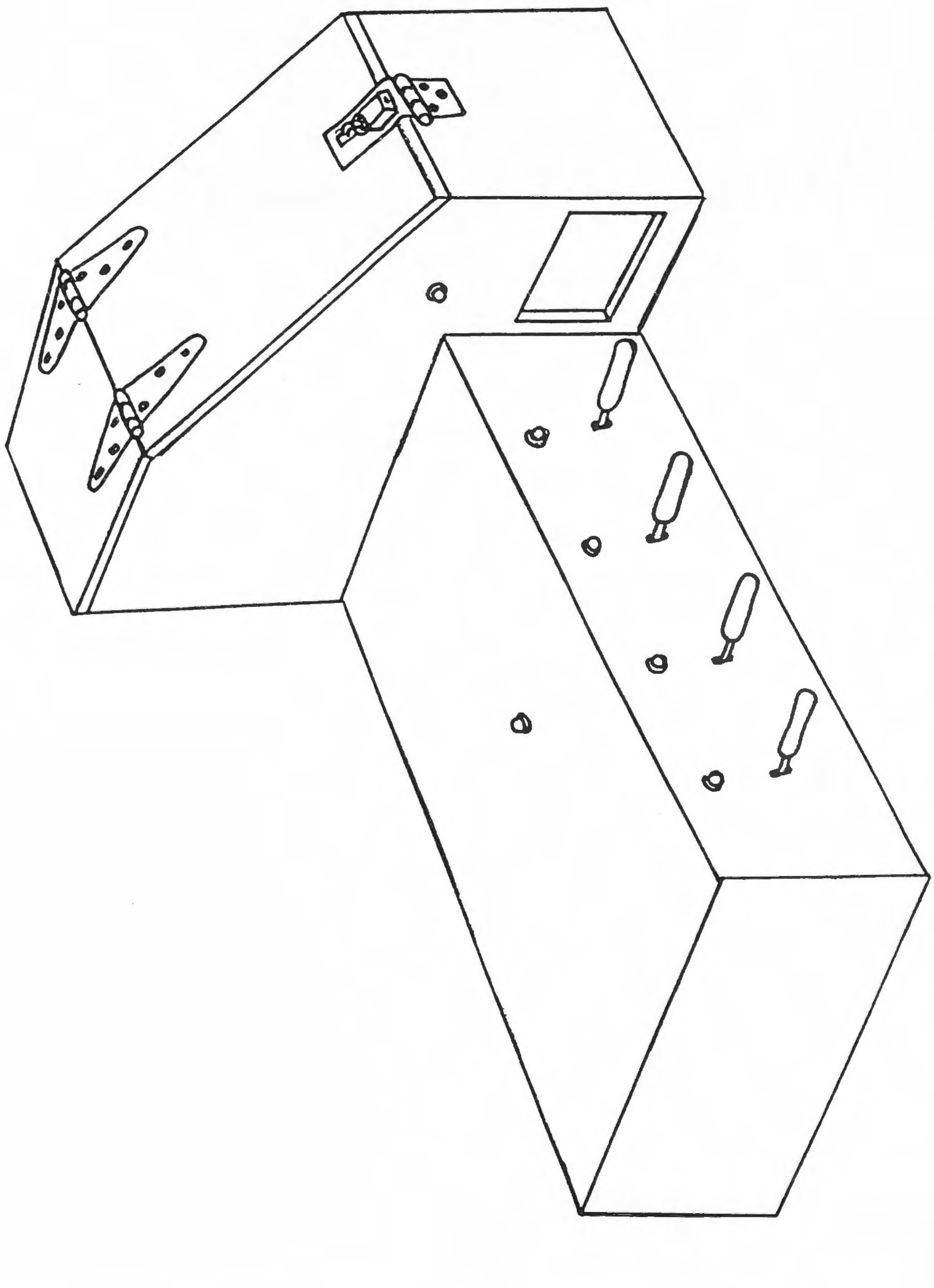
Thirteen children (six males and seven females), ages four years zero months to five years six months, with no known behavioral or intellectual deficits, served as subjects. The subjects attended the USU College of Family Life Developmental Laboratory School.

Apparatus and Setting

Sessions were conducted in a 4.7 m x 4.7 m room in the Family Life Building at Utah State University. This room contained the apparatus described below as well as several chairs, toys, and a box of assorted stickers.

The apparatus (shown in Figure 1) consisted of a 39.4 cm X 64.8 cm X 20.3 cm black wooden box that contained four horizontally mounted stainless steel levers separated from one another by 12.7 cm. The levers closed microswitches only if the levers were operated in a particular direction. From left to right, the response topographies were lift (Lever A), pull (Lever B), depress (Lever C), and push (Lever D). Connected to the apparatus, in a 39.4 cm X 25.4 cm X 44.5 cm wood and plastic container, was a nickel dispenser that allowed the subjects to see the tokens (i.e., Mexican five centavos) earned but did not allow access to the tokens until the session was over. Above the plastic window of the token dispenser was an amber light that flashed when a token was dispensed. A white session light located on the top of the apparatus was illuminated during all sessions. The apparatus was bolted to a small table (approximately 61 cm in height). In front of the apparatus was a child-size chair for the subject.

All controlling and recording equipment was located in an adjacent control room with a one-way mirror that allowed for observation of the subjects. A Commodore PET computer (Model 4016) with a specially designed interface (Crossman, 1984) was used to program the apparatus and to record the subjects' responses. The data were recorded on cassette tape and later analyzed on the same computer.



Procedure

Subjects were escorted from the preschool through a long hallway to the experimental room by the examiner, who is the author of this dissertation.

Training phase. During the training phase, subjects were exposed, individually, to the apparatus with only one lever present. This was accomplished by removing the other levers. Three of the four levers were used in training. The fourth, or novel, lever was manipulated by the model in modeling conditions and was never present during the training phase. Upon entering the experimental room, subjects were read the following instructions ([ ] signify modifications for Days 2 and 3 and {} indicate instructions for Day 1 only):

"Today, (Child's name), we are going to play with this machine [again]. When I tell you to start, I would like you to play with that handle (point). It will either go up, down, in, or out. [Remember that] Sometimes the machine makes a noise. Don't be scared. It's only the penny[1] machine inside. When we are finished, we will count all the pennies that you have. For every five pennies that you have, you will be able to buy one sticker from this box (show). {Does that sound like fun? Good!} While you are playing, I am going to be in the next room working. I will come back when you are finished. Are you ready? Okay, begin."

Subjects performed 100 responses in each of three training sessions on three successive days. The schedule of reinforcement for the first lever used in training was a fixed ratio 5 (FR 5); i.e., reinforcement contingent upon every fifth response. The order of presentation of the first lever used in training was counterbalanced so that for some subjects it was Lever A, and Lever B, C, or D for the other subjects. The sequence of levers used in training for each subject is listed in Table 1.

On the second and third days of training, subjects were exposed only to the second and third levers, respectively. Responses on the second lever were rewarded on an FR 10 schedule, and on the third an FR 20 schedule. Therefore, subjects received 20, 10, and 5 tokens on Training Days 1, 2, and 3. Session length varied with rate of responding and usually lasted from one to three minutes. At the conclusion of each session, the examiner removed the tokens and counted them with the subject. Subjects received one sticker for every five tokens. The examiner told the subject how many stickers he/she was allowed to have and exchanged the tokens for stickers. Subjects were thanked for participation, reminded of participation the next day, and returned to the classroom.

Test phase. After three days of training, subjects were randomly divided into three conditions. Subjects in these conditions were exposed to the apparatus with all four levers present for two 2-minute extinction periods (i.e., responding did not produce tokens) that occurred two minutes before and two minutes after exposure to the model. During this phase, subjects were brought to the experimental room and read the following instructions:

"Today we are going to play with the machine again. You can play with the machine any way you want. Sometimes the penny machine doesn't work. Don't be mad if it doesn't. While you are playing, I am going to be in the next room working. I will come back when you're finished, and we will count how many pennies you have. You will be able to buy a

Table 1

Response Training Levers and Response Rates for Subjects in Experiment Ia

Subject	Training 1	Training 2	Training 3
	FR 5	FR 10	FR 20
1	A (.51)	B (1.69)	C (1.85)
2	A (.82)	B (1.01)	C (1.60)
3	B (1.13)	C (.65)	D (1.85)
4	B (2.10)	C (2.68)	D (1.56)
5	C (1.84)	D (2.03)	A (1.75)
6	C (.85)	D (1.39)	A (1.14)
7	D (.26)	A (.96)	B (.49)
8	D (.76)	A (.90)	B (.72)
9	A (.54)	B (.80)	C (.81)
10	A (.43)	B (.59)	C (1.32)
11	B (1.49)	C (1.65)	D (1.80)
12	C (.94)	D (1.60)	A (1.52)
13	C (.60)	D (1.76)	A (1.41)

Note. Rates in parentheses are responses per second as measured from the subjects' first response; A = Lever A (lift); B = Lever B (pull); C = Lever C (depress); D = Lever D (push).

sticker for every five pennies. Are you ready? Okay, begin."

The first two-minute extinction commenced. (Extinction was originally scheduled for five minutes, but the initial subjects either stopped responding or showed emotional distress and asked to leave. Extinction was then shortened to two minutes.)

At the conclusion of the first extinction period, the examiner entered the experimental room with the model (a male undergraduate psychology student) and said the following:

"This is my friend Dennis. Let's watch him take a turn with the machine." In one condition (model-with-reinforcement), the model then proceeded to respond on the untrained, or novel, lever. At this time, the subject and examiner stood to the side of the apparatus in order to allow the subject to clearly observe the model.

During the modeling phase, the model performed 25 responses with no obvious emotional behavior (e.g., pleasure). During the model-with-reinforcement condition, the schedule was fixed ratio 5. For the initial subjects (S1 and S3), the model performed at an average rate (compared to the rates of S1 and S3 on the training response). It was reasoned that subjects' response rates were a possible dependent variable that would augment a social learning theory interpretation if the subjects not only performed the modeled response but also the model's rate of responding. Other subjects were exposed to either a low-rate model (S5, S6, S7, S8) or a high-rate model (S11, S12, S13).

After the model performed 25 responses, the examiner said:

"Okay, (Child's name), now it's your turn to play again. We will wait outside until you are finished." The second two-minute extinction period now began. Note that in the model-with-reinforcement condition, the tokens earned by the model remained inside the plastic container. At the conclusion of this phase, subjects were told that although they did not receive any pennies, they could still choose a sticker for working hard. The child was then returned to the classroom and his/her participation concluded. Although there was a possibility of discussion regarding procedures between subjects in their classroom, children typically put their stickers in their lockers and resumed the group activity upon returning to the classroom.

In another condition (model-with-no-reinforcement), the same procedure was followed but the model received no tokens for lever responses. In the control condition (no model), the model was brought into the room and the examiner said:

"This is my friend Dennis. I want to show him the machine (model walks to the apparatus and scans for 10 seconds). Okay, (Child's name), now it's your turn to play again. We will wait outside until you are finished."

Ostensibly, this latter condition controlled for the possible influence of interruption of the session by the model.

Results and Discussion

One result of Experiment Ia was that subjects performed the modeled response when subjects were exposed to the reinforced model (S1, S5, S6, S11, S13), although S13 did not perform the greatest number of responses on the modeled lever. This is illustrated by the last two columns in Table 2. This effect occurred despite the absence of many of the variables that have been previously discussed as enhancing imitation (e.g., alternate-trial design, presence of examiner, previous history with model, similarity of model). Therefore, the social learning

Table 2

Extinction Data and Modeled Responses for Experiment Ia Subjects[1]

	Subject	Sex	Training sequence	First extinction phase**			Model response		Second extinction phase			Evidence for model following	
				1st R	% R	Rate	Lever	Rate	1st R	% R	Rate	1st R	% R
Model reinforced	S1	M	ABC	*	C	(*)	D	(*)	*	D	(*)	*	Y
	S5	M	CDA	C	C	(1.04)	B	(.47)	B	B	(1.41)	Y	Y
	S6	F	CDA	C	C	(1.00)	B	(.46)	B	B	(.83)	Y	Y
	S11	M	BCD	C	C	(2.07)	A	(2.39)	A	A	(1.56)	Y	Y
	S13+	F	CDA	D	C	(.87)	B	(2.05)	B	C	(.87)	Y	N
Model not reinforced	S3	F	BCD	D	D	(1.40)	A	(1.83)	D	D	(1.03)	N	N
	S7	F	DAB	B	B	(*)	C	(*)	C	C	(*)	Y	Y
	S8	M	DAB	C	D	(.56)	C	(.47)	D	D	(.52)	N	N
	S12	F	CDA	A	D	(.23)	B	(2.64)	D	D	(1.09)	N	N
No model	S4	M	BCD	C	C	(2.34)			C	C	(2.19)	-	-
	S9	F	ABC	D	D	(.79)			D	B	(.75)	-	-
	S10	M	ABC	C	D	(.97)			D	C	(1.46)	-	-

Note. * = data not available due to programming or loading error; rates in parentheses are responses per second as measured from the subjects' first response; + = had a four-minute initial extinction period due to loading error; 1st R = first response emitted; % R = the greatest percentage of responses; Y = yes; N = no; [1] = S_2 refused to participate in this session; ** = novel lever added; M = male; F = female.

interpretation of vicarious reinforcement appears to be a viable hypothesis to test further given the described procedures because this interpretation would predict that vicarious reinforcement increases the tendency of the observer to behave in a manner that is similar to the model. There were also apparent modeling effects in one subject (S7) in the absence of reinforcement of the model.

One possible reason for following the model may be that the model was reinforced on an FR 5 as opposed to a schedule with a lower frequency of reinforcement. It might be instructive to investigate whether subjects follow a model if the model is reinforced on the novel lever at a rate that is comparable to one of the schedules used in training with a lower frequency of reinforcement (i.e., FR 10, FR 20).

The supposition that subjects would follow the model's rate when responding on the same lever as the model was not supported since rates did not consistently increase or decrease relative to the model's rate (Table 2). This result does not support the findings of Borden (1973/1974), who did find an imitation of rate.

One other purpose of Experiment Ia was to discern the discriminability of the training responses. If a discriminative stimulus interpretation of vicarious reinforcement is to be tested given the foregoing procedures, it is necessary to have discriminable responses that the subjects can perform when the discriminative stimulus (i.e., vicarious reinforcement) is available. The responses need to be discriminable not only in topography but also in regard to the amount of reinforcement received on each lever so that the subject's choice of lever is predictable based on the subjects' history with the schedule with the smallest ratio requirement (Catania, 1966). In fact, some subjects (e.g., S11, S13) did not respond on the training response with the smallest ratio requirement during the first extinction period (see Table 2), thereby raising the possibility of an inadequate length of training, or schedules of reinforcement that were not discriminable, or both. Some subjects (e.g., S3, S7, S10, S12) initially responded on the most recently trained response.

Among other things, the results of Experiment Ia demonstrated that there was no preference evident for a particular lever (irrespective of manipulations), and the average response rates across subjects were similar for the four responses ($\underline{M}_A$ = .99 rps [responses per second], $\underline{M}_B$ = 1.11 rps, $\underline{M}_C$ = 1.34 rps, $\underline{M}_D$ = 1.44 rps, $\underline{F}$ (3,35) = 1.29, $\underline{p}$ = .29).

Given these results, the focus of Experiment Ib was to assess the behavior of subjects who observed a model receive reinforcement and to determine whether vicarious reinforcement signals the availability of reinforcement for alternative behavior or increases the likelihood that subjects would imitate the model. This assessment occurred in an experimental setting that used tangible rewards and controlled the experimental histories of subjects in regard to alternate responses. If subjects perform the modeled response after observing vicarious reinforcement, then evidence for the social learning interpretation is obtained, whereas responding by subjects to alternate responses is evidence for the discriminative stimulus interpretation.

Experiment Ib Method

In Experiment Ib, subjects performed the same number of training responses on three levers. After training, subjects responded in a procedurally defined extinction period, were exposed to one of three modeling conditions and given the opportunity to respond for a second time in extinction. Based on the preliminary results of Experiment Ia, it was hypothesized that subjects who observed a model receive reinforcement would respond on the same lever as the model in the second extinction period. Except for no longer counterbalancing the order of exposure to the levers, the procedures for Experiment Ib were the same as Experiment Ia.

Subjects

An additional six children (five males and one female) with no known intellectual or behavioral deficits and also from preschools at Utah State University (Family Life Laboratory and Children's House) served as subjects. The data from these six children were combined with test data from 12 of 13 subjects from Experiment Ia. (Recall that subject S2 refused to participate in the test phase). The ages for these 18 children who completed all phases of the study ranged from four years and zero months to five years and six months (*M* = 57 months). Table 3 contains the characteristics of these 18 subjects. Note that Table 3 does not include two subjects who refused to continue during the course of the study and two subjects whose data were lost because of a computer malfunction.

Apparatus and Setting

The same apparatus and setting used in Experiment Ia were used in Experiment Ib.

Procedure

A similar procedure to Experiment Ia was used except the order of levers presented was no longer counterbalanced. Therefore, the six

Table 3

Age and Sex of Subjects Utilized in Experiment Ib

Group	ID	Sex	Age[a]
Model with reinforcement	S1	M	5-1
	S5	M	5-6
	S6	F	4-10
	S11	M	4-7
	S13	F	4-0
	S22	M	4-5
Model without reinforcement	S3	F	4-4
	S7	F	5-3
	S8	M	5-4
	S12	F	4-7
	S19	M	4-0
	S20	M	4-6
No model	S4	M	5-6
	S9	F	5-1
	S10	M	5-4
	S15	F	4-6
	S17	M	4-9
	S21	M	4-11

Note. M = male; F = female; [a] = age in years and months.

remaining subjects were trained on Levers A, B, and C, in that order.

Training phase. Subjects performed 100 training responses each day. The training schedule of token reinforcement was FR 5 on the first day, FR 10 on the second day, and FR 20 on the third day. The token exchange rate was the same as Experiment Ia. Five tokens were exchanged for one sticker.

Test phase. The same procedure used in Experiment Ia was used. The six subjects were assigned to a different condition in order to equalize the number of subjects (six) in each condition (model-with-reinforcement, model-without-reinforcement, or no-modeling).

Results[2]

The major dependent variables were: (1) the subjects' first responses in the second extinction period, and (2) the percentage of responding across the four levers in the extinction periods. The percentages of responding in the extinction period prior to and after the modeling condition and the subjects' first response in the second extinction period are presented in Table 4.

In order to assess differences in the training of the three experimental groups, a multivariate analysis of variance (MANOVA) was used to compare percentages of responding in the first extinction period (i.e., before exposure to the model) across levers. No statistical differences between groups before observing the model were found (Table 5). However, a MANOVA revealed differences between groups in the second extinction period (i.e., after exposure to the modeling condition), and univariate F tests identified Lever D as the variable that most likely accounted for the variance.

Correlated t-tests revealed significant differences between the

Table 4

Percentages of Responses Across Levers in Extinction Periods and First Responses After Model

Subject	First extinction					First R	Second extinction				
		Levers						Levers			
	No. of R	FR 5[a] (A)	FR 10 (B)	FR 20 (C)	NOV (D)		No. of R	FR 5 (A)	FR 10 (B)	FR 20 (C)	NOV (D)
					Model with reinforcement on Lever D						
S1	(209)	3	7	68	22	D	(109)	0	0	8	92
S5	(228)	59	41	0	0	D	(157)	0	0	0	100
S6	(114)	64	0	36	0	D	(97)	0	20	0	80
S11	(247)	0	100	0	0	D	(175)	0	0	0	100
S13	(104)	65	19	11	5	D	(97)	64	2	0	34
S22	(186)	23	0	77	0	D	(129)	7	0	0	93
					Model without reinforcement on Lever D						
S3	(207)	0	0	100	0	C	(131)	0	0	100	0
S7	(90)	0	0	100	0	D	(64)	0	0	100	0
S8	(50)	56	16	0	28	A	(57)	68	14	0	18
S12	(23)	30	48	22	0	B	(118)	24	39	37	0
S19	(136)	0	0	85	15	C	(159)	0	0	100	0
S20	(181)	0	0	100	0	C	(127)	0	0	83	17
					No-model condition						
S4	(280)	3	70	11	16	B	(185)	11	43	35	11
S9	(92)	10	7	30	53	D	(88)	17	30	27	26
S10	(114)	13	6	36	45	D	(172)	12	0	55	33
S15	(106)	0	0	100	0	B	(102)	0	11	9	80
S17	(27)	26	15	59	0	C	(47)	32	45	23	0
S21	(139)	0	0	60	40	C	(112)	0	0	87	13

Note. FR = fixed ratio; R = responses; NOV = novel lever; [a] = these FR schedules reflect those used in training and are called Levers A, B, D, and D for convention.

Table 5

Multivariate and Univariate F Scores for Levers by Model Condition

Lever	Session before model		Session after model	
	F	Approx *F*	*F*	Approx *F*
		1.31		2.50*
A	2.27		0.04	
B	0.52		2.05	
C	1.37		4.31*	
D	3.12		6.99**	

Note. Approximate *F* obtained from Pillai's Trace; * = significant at .05; ** = significant at .01; df = (2,15).

percentage of responding on Lever D (the modeled, or novel, lever) before and after the modeling condition but only for the model-with-reinforcement group (see Table 6).

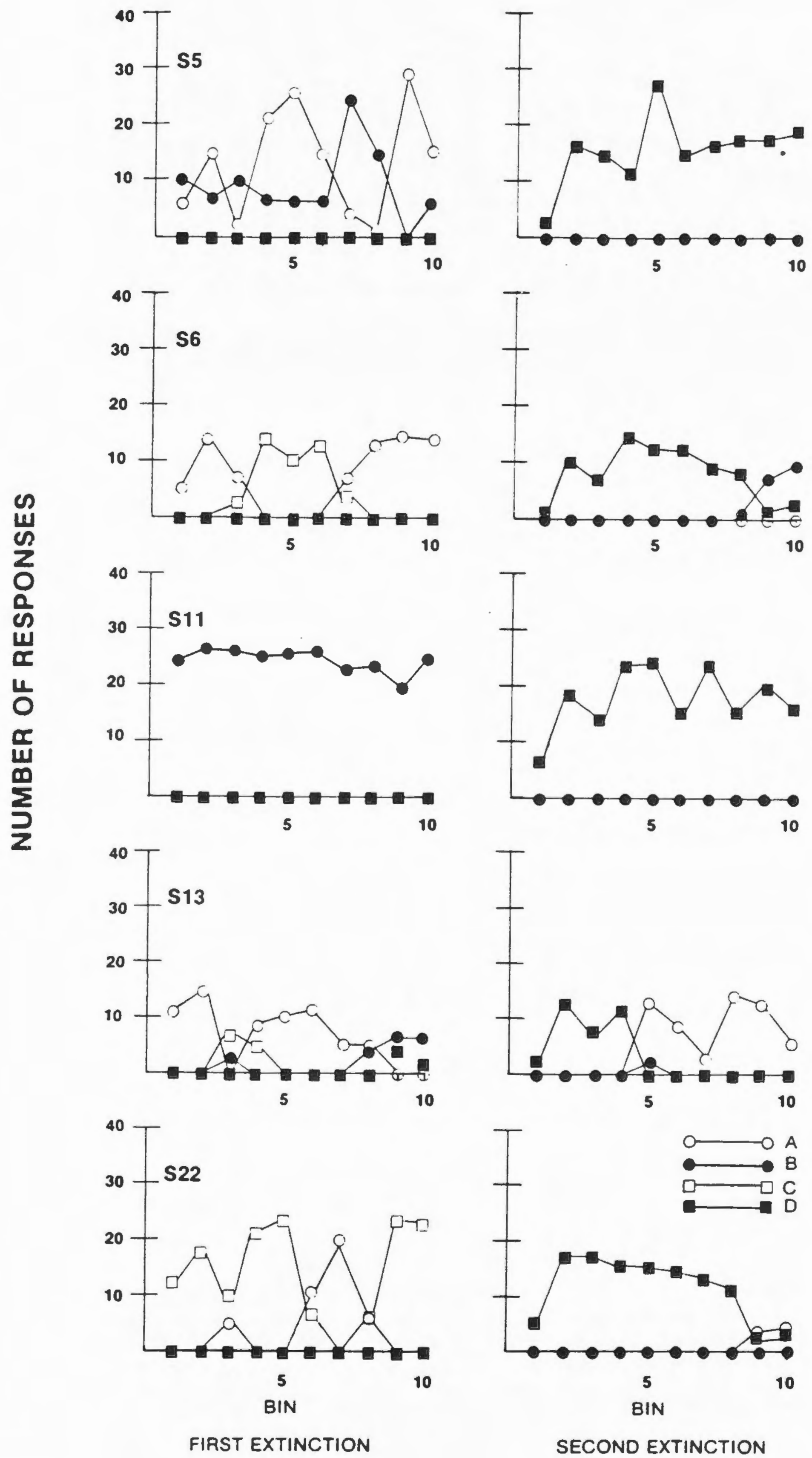
Table 6

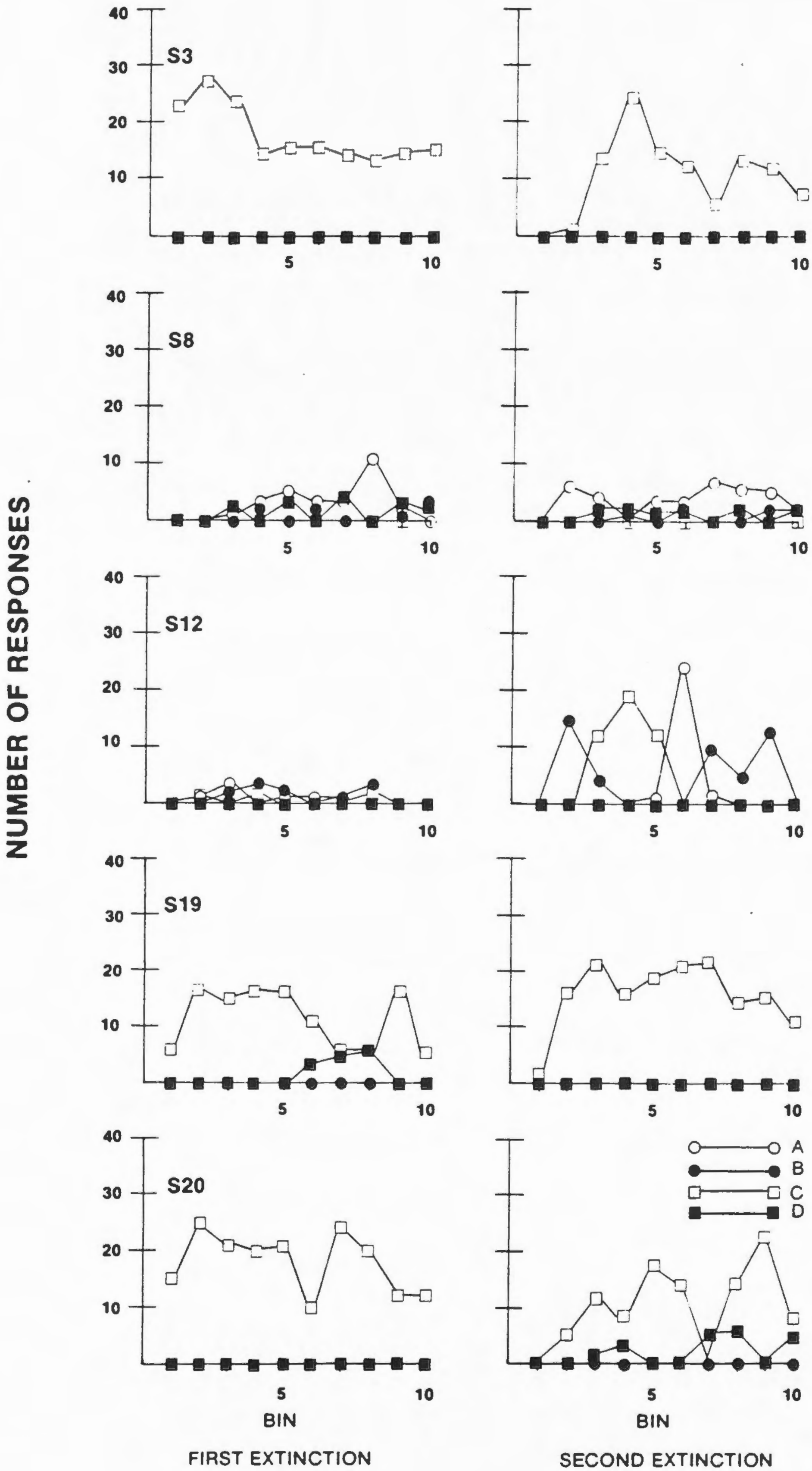
Means, Standard Deviations, and Correlated t Scores for Percentages of Responses on Lever D

Condition	PRE		POST		t
	M	SD	M	SD	
Model with reinforcement	4.50%	0.08	82.83%	0.24	-7.18*
Model without reinforcement	7.17%	0.11	22.50%	0.38	-0.77
No model	25.67%	0.23	27.17%	0.28	-0.09

[a] $n = 6$ for each group; $*p < .01$.

Additionally, Figure 2 illustrates individual responding on all four levers in both extinction periods for the model-with-reinforcement group. Number of responses performed on each lever in 12-second intervals (10 per extinction period) is reported for only five of the six subjects in this group because an equipment malfunction prevented S1's data from being recorded. Figure 3 illustrates responding for the model-without-reinforcement group, and Figure 4 illustrates responding in the no-model group. Note that data from subjects S7 and S15 are not presented in Figures 3 and 4, respectively, because of an equipment malfunction. Also note that data points illustrating responding on some levers (e.g., Lever D) may occasionally mask responding on Levers A and C.


NUMBER OF RESPONSES
S5
S6
S11
S13
S22
40
30
20
10
5
10
A
B
C
D
BIN
FIRST EXTINCTION
SECOND EXTINCTION


NUMBER OF RESPONSES
S3
S8
S12
S19
S20
40
30
20
10
5
10
A
B
C
D
BIN
BIN
FIRST EXTINCTION
SECOND EXTINCTION

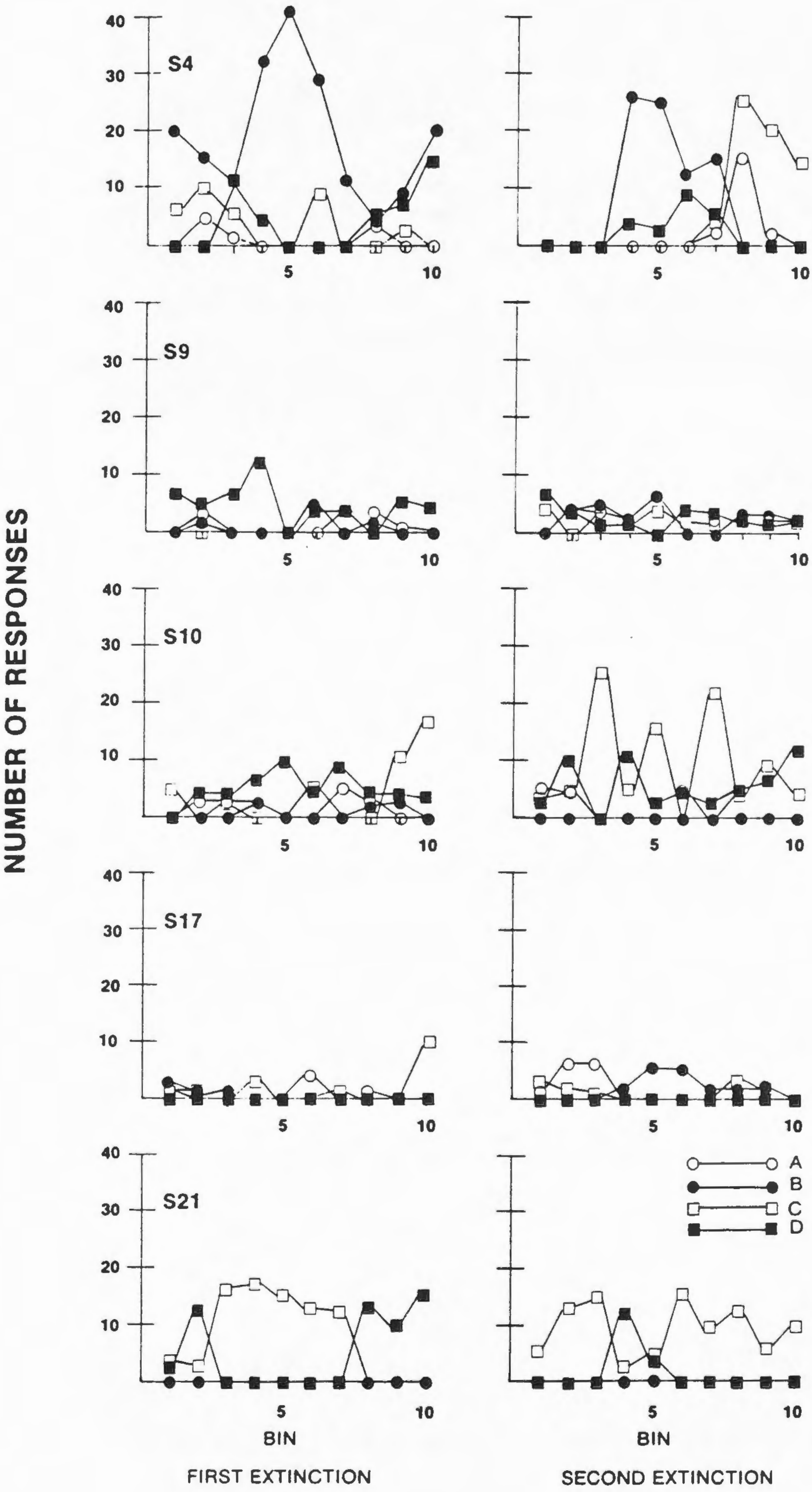

NUMBER OF RESPONSES
S4
S9
S10
S17
S21
40
30
20
10
5
10
A
B
C
D
BIN
BIN
FIRST EXTINCTION
SECOND EXTINCTION

Figure 2 illustrates the effect of observing a model receive reinforcement for responding on Lever D. Although there was virtually no responding on Lever D during the first extinction period, all subjects responded on Lever D in the second extinction period and maintained responding on Lever D for all or most of the two-minute period. However, three subjects (S6, S13, S22) began to show extinction effects. In contrast, subjects in the model-without-reinforcement condition continued to respond in the second extinction period as they did in the first extinction period (Figure 3) and showed virtually no responding on the modeled lever. Although subjects in this condition observed a model respond on Lever D, the model received no tokens in this condition.

Figure 4 illustrates that for the no-model group, responding in the second extinction was similar to the first extinction period. This result was expected given the absence of a modeling treatment.

Although subjects in the no-model and model-without-reinforcement conditions did not follow the model, their responding did show some regularity. For example, several subjects (S3, S19, S20, and S21) showed a preference for Lever C. Also, the rate of responding between the two extinction periods (as illustrated by Figures 3 and 4) was fairly consistent (S12 an obvious exception).

Discussion

The hypothesis that subjects would respond on the same lever as the model who was reinforced was supported. The data clearly demonstrate that there is little or no responding on Lever D in the first extinction period but increased responding in the second extinction period for those subjects who observed a model receive tokens for responding on

Lever D (Figure 2). It would appear that under conditions where subjects have an experimental history of alternate responses that are tangibly reinforced, the social learning interpretation of vicarious reinforcement (i.e., Bandura, 1977) more readily accounts for the effects of vicarious reinforcement than a discriminative stimulus account (i.e., Kazdin, 1979).

The social learning interpretation of vicarious reinforcement was supported despite the absence of some variables that have been described as enhancing imitation (e.g., alternate-trial design, presence of the examiner during subjects' performances, previous history with the model). However, a close examination of Figure 2 reveals that although all subjects followed the model and responded on Lever D, three subjects (S6, S13, S22) decreased their responses on Lever D and responded on alternate levers before the two-minute extinction period expired. These data signal the likelihood that vicarious reinforcement effects are short lived and support the extinction hypothesis postulated by Ollendick and his colleagues (Ollendick et al., 1983). Recall that in their study, Ollendick and his colleagues observed an initial increase in performing as the model did, but the lack of direct reinforcement to the observer quickly resulted in the extinction of the modeled response. Additionally, some subjects in the present experiment displayed emotional behavior (e.g., crying) when they did not receive tokens as the model did. Similar negative emotional behavior was reported by Ollendick.

Although the results of both portions of Experiment I support the social learning interpretation of vicarious reinforcement, it is critical to recall the procedure of this experiment and the experimental history given to the subjects. In both portions of Experiment I, extinction was defined procedurally, tokens were assumed to be reinforcers, and training sessions were relatively short (about two minutes). For some subjects (e.g., S3, S19, S20, S21, S22) Lever C was the preferred response in the first extinction period, suggesting a recency effect because subjects were trained on Lever C in the session prior to the extinction session. This finding is consistent with early studies on memory which found that recall was dependent on recency of impression (see Woodworth & Schlosberg, 1954). Also, for subjects S3 and S20 there was responding exclusively on Lever C during the first extinction, which does not support the notion that when a recently reinforced response is extinguished, a previously reinforced response "resurges" (Epstein, 1983). However, the lack of support may have been due to the short duration of extinction. Usually the subjects in this experiment responded on more than one lever in the first extinction period.

Given the results of Experiment Ib, another experiment was conducted to extend the findings of the present experiment. Specifically, Experiment II extended the extinction session after the model intervention to assess better the extinction hypothesis (Ollendick et al., 1983). By allowing a longer session after the model condition, the hypothesis that subjects will respond like the model for only a short time before the modeled response is extinguished can be more thoroughly investigated. Moreover, the experiment was designed to allow for availability of some tokens during the extinction sessions in order to reduce emotional behavior; it provided an extensive history of responding on all training levers, including the modeled lever; it allowed for extinction (and, thus, reinforcement) to be functional; it allowed the examiner to assess differences in high-frequency and low-frequency reinforcement schedules for the model and the effect on the subjects of observing a model receive response-independent reinforcement.

EXPERIMENT II

In Experiment II, in order to answer some of the questions raised by Experiment Ib, subjects were trained to a stability criterion of responding (see below) on three levers, exposed to a modeling condition, and then assessed for vicarious reinforcement effects during an extinction session. Unlike Experiment Ia and Ib, this experiment allowed the subjects to have access to all available levers in all phases. Also, extinction was functional in that it was response based, the model received a high or low rate of reinforcement, and the model performed on a trained response that previously had never been reinforced. This latter aspect of Experiment II provided a stronger test of the social learning interpretation of vicarious reinforcement because subjects were never reinforced on the modeled lever during training and because subjects were given a more extensive responding history on this lever than subjects in Experiment I (cf. Draper 1976/ 1977). The question is whether vicarious reinforcement increases the likelihood that subjects imitate a model under these conditions as well. Given that subjects observed a model whose specific responses were reinforced, Experiment II investigated whether vicarious reinforcement occurs when a subject has a history of responding on a modeled lever and is never reinforced on this lever. Given the results of Experiment Ia and Ib, it was hypothesized that the subjects would perform the modeled response when and only when the model was reinforced.

Method

Subjects

An additional 29 preschool children, ages four years and one month to six years and three months (*M* = 59 months), who attended the USU Children's House and Creative Learning (Linwood, NJ) preschools served as subjects. Table 7 contains the characteristics of subjects who completed participation in Experiment II and does not include six subjects who refused to continue participation during the course of the study, two subjects who did not meet training criteria (see below), one subject who became ill, and two subjects whose data were lost due to computer or operator error.

Apparatus and Setting

The same apparatus used in Experiment I was used in this experiment. However, only three levers (A, B, and C) were used in this experiment, and each lever had a red stimulus light located directly (6 cm) above it. The use of a session light was discontinued.

Five subjects (N1, N2, N4, N7, N8) participated at USU in the same setting as Experiment I. The remaining subjects participated in a similar setting at a Creative Learning Preschool in a 4.1 m x 4.9 m music room that contained a piano, the controlling equipment, and a box of assorted stickers. The experimenter and controlling equipment were shielded from the subject and apparatus by a room divider. Also, at Creative Learning a Commodore 64 and 1541 disk drive were used to program the apparatus through a custom-designed interface (Crossman, 1984) and to record the subjects' responses.

Table 7

Age and Sex of Subjects Participating in Experiment II

Group	ID	Sex	Age[a]
Model with FR 5 reinforcement	N1	M	4-9
	N2	F	4-7
	N4	M	5-3
	N7	M	4-2
	N8	M	4-5
	L2	M	5-0
	L4	F	5-6
	L30	M	5-6
Model with FR 25 reinforcement	L6	M	4-10
	L8	M	4-3
	L16	M	4-11
	L17	M	4-10
	L20	M	5-0
	L27	F	5-6
	L28	F	4-10
Model without reinforcement	L9	M	4-11
	L11	M	4-3
	L12	M	4-8
	L14	F	4-8
	L19	M	4-5
	L21	F	5-10
	L31	M	4-11
Model with noncontingent reinforcement	L5	F	4-6
	L13	M	4-1
	L22	F	5-10
	L24	M	5-8
	L25	F	4-8
	L29	M	5-11
	L32	F	6-3

Note. M = male; F = female; [a] = age in years and months.

Procedure

Subjects were escorted from their respective preschools to the experimental room by the author of this dissertation.

Training phase. During the training phase, subjects were exposed individually to the apparatus with all three levers present. Upon entering the experimental room, subjects were read the following instructions. ([ ] indicate changes for Session 2 through termination and indicate instructions for Day 1 only).

"Today, (Child's name), we are going to play with this machine [again]. When I tell you to start, you can play with the handles any way you want, but only play with one handle at a time. The handles go in different directions (show direction without touching lever): up, out, and down. Sometimes the machine will make a noise. Don't be scared. It's only the penny machine inside. [Remember that sometimes the penny machine will make a noise.] When we are finished, we will count all the pennies you have. For every five pennies you will be able to buy one sticker from this box (show). Does that sound like fun? Good.

Sometimes the lights (point) will help you get more pennies, but sometimes the lights will not affect the penny machine. The more pennies you get, the more stickers you can have.

While you are playing, I will be in the next room working (I will be behind here working [at Creative Learning]). I will come back when the lights go off. At that time, we'll count your pennies and give you your stickers. Are you ready? Begin."

At this time, the red stimulus light over one lever was illuminated for 30 seconds. Subsequent lights were randomly and singly illuminated each subsequent 30 seconds for the duration of the 4.5- minute session. The order of presentation of the three stimulus lights was chosen randomly with the condition that no one light could appear more than three times (90 seconds total). Therefore, each light was illuminated an equal proportion of the session time. A multiple schedule of reinforcement (mult FR 5 EXT FR 20) was programmed on Levers A, B, and C so that an illuminated light above a particular lever activated the corresponding schedule. Responses on levers without the illuminated light were recorded; however, they had no effect on the ratio requirements. Responses that accrued toward a ratio requirement were carried over to the next time that ratio requirement occurred.

At the conclusion of each session, the examiner removed the tokens and counted them with the subject. The examiner told the subject how many stickers he/she was allowed to have and exchanged the tokens for the stickers. Subjects were thanked for participation, reminded of playing the next day, and returned to the classroom.

When subjects had a minimum of three but a maximum of six training sessions, and either (1) subjects decreased responding on Lever B as training progressed or (2) responses on the FR 5 Lever (A) as well as the extinction lever (B) numbered more than 200 for their entire training, they entered the next phase. This latter criterion was selected because a major purpose of this phase was to give subjects an extended history of responding on Lever B without reinforcement. However, some subjects ceased responding on Lever B before emitting 200 responses but entered the next phase because they did have some history with Lever B. These subjects demonstrated extinction effects on Lever B during training. All subjects' responses to Lever B were eventually extinguished functionally before the model was introduced. Note that two subjects did not meet the criteria for responding by the end of the sixth session and were dropped from the study.

Extinction on Lever A phase. This phase was similar to the previous phase except that responses on Lever A did not produce tokens and stimulus lights above all three levers were illuminated for the entire 4.5-minute session. Therefore, the schedule for this phase was a concurrent schedule of reinforcement (conc EXT EXT FR 20). The same instructions used in training were read to the subjects during this phase.

When subjects' responding was stable in that responses to both extinction levers (A and B) numbered less than 15% of the total number of responses for a particular session, subjects entered the final phase.

Test phase. Subjects participated in one session in this phase. At the beginning of the session, the examiner entered the experimental room with the model (a male undergraduate from either USU or Stockton State College in New Jersey) and said the following:

"This is my friend Dennis. Let's watch him take a turn with the machine." The model sat in front of the machine and responded on Lever B (the lever that had never produced tokens.)

During the modeling phase, the model performed 25 responses. During the model-with-high-reinforcement condition, the schedule for the model was FR 5. During the model-with-low-reinforcement condition, the schedule was FR 25. The model performed 25 responses but received no tokens during the model-with-no-reinforcement condition. All three stimulus lights were illuminated during the modeling and subsequent extinction portion of this phase. Also, the model's tokens were not exchanged but remained visible through the plastic container. This allowed the subject to respond immediately after observing the model.

After the model finished responding, the examiner said:

"Okay, (Child's name), now it's your turn to play again. We will wait outside (behind here [at Creative Learning]) until you are finished." A 4.5-minute extinction period similar to the previous phase (i.e., conc EXT EXT FR 20) commenced. At the end of this session, the child exchanged his/her tokens for stickers and concluded his/her participation.

In another condition (model with noncontingent reinforcement), the same procedure as above was followed, although the model did not respond. However, in order to control for the arousal of the subjects by the delivery of reinforcement, the model received tokens (cf. Killeen, 1975). In this condition, the model was brought into the room and the examiner said:

"This is my friend Dennis. I want to show him the machine." (Model sat in front of the machine with his hands in his lap and, without responding, received five tokens dispensed one every five seconds.) "Okay, (Child's name), now it's your turn to play again. We will wait outside until you are finished."

As in both portions of Experiment I, children usually participated in one session daily on consecutive school days, although Experiment II contained more sessions. Also, Experiment II assessed two levels of the independent variable (FR 5 and FR 25 reinforcement for the model) and included a condition that controlled for reinforcement of the model per se (model with response-independent reinforcement).

Results

As in Experiment Ia and Ib, the major dependent variables were the subjects' first responses and the percentages of responding across the three levers after the model condition. The percentages of responding in the session prior to and after the modeling condition and the subjects' first responses after observing the model are presented in Table 8. Note that there was almost exclusive responding on Lever C in the session before the model. This was due to the stability criterion implemented that insured the subjects' experimental histories were functionally equivalent before the introduction of the independent variable and that responding on Levers A and B was functionally extinguished.

Correlated *t*-tests revealed no significant statistical differences from the pre-model to post-model extinction periods on the percentage of responding on Lever B (the modeled lever), but a higher percentage on Lever B was noted for those subjects who observed a model receive tokens for responding on Lever B (Table 9).

Figure 5 illustrates individual responding on all three levers in the session before observing the model and the period following the model with FR 5 reinforcement. Note that unlike Experiment Ia and Ib, this figure illustrates responding for approximately 4.5 minutes. However, the same scale (12-second intervals) is used to facilitate comparison of response rates between experiments. Note that unlike Experiment 1, the subjects' responding in the session prior to the model is more uniform because in Experiment II, subjects' responding was functionally equivalent and consisted of almost exclusive responding on Lever C. Figure 5 contains data for eight subjects. Subject N1 stopped

Table 8

Number of Sessions, Percentages of Responses Across Levers in Extinction Period Before and After Model, and First Response After Model

Subject	No. of Training Sessions	No. of EXT A Sessions	Session before model				First R	Session after model			
				Levers					Levers		
			No. of R	EXT_a (A)	EXT (B)	FR 20 (C)		No. of R	EXT_a (A)	EXT (B)	FR 20 (C)
			Model with FR 5 on Lever B (n = 8)								
N1	6	2	(102)	0	0	100	B	(84)	0	44	56
N2	3	3	(349)	6	2	92	B	(298)	0	27	73
N4	5	3	(263)	0	0	100	C	(350)	0	0	100
N7	4	2	(402)	5	5	90	C	(368)	0	0	100
N8	3	1	(469)	4	1	96	B	(300)	3	12	85
L2	4	3	(333)	0	1	99	B	(180)	23	77	0
L4	3	2	(491)	9	2	89	C	(396)	0	1	99
L30	5	1	(422)	0	0	100	C	(404)	0	0	100
L6	3	1	(456)	5	0	95	B	(445)	26	1	73
L8	4	1	(353)	6	1	93	B	(228)	43	25	32
L16	4	2	(402)	0	0	100	B	(351)	0	18	22
L17	3	2	(476)	14	1	86	C	(540)	2	2	96
L20	4	2	(380)	9	1	91	C	(461)	2	1	98
L27	5	2	(201)	13	1	86	C	(205)	1	8	91
L28	3	1	(281)	0	1	99	C	(320)	0	0	100
			Model with no Sr+ on Lever B (n = 7)								
L9	3	1	(438)	6	4	90	C	(461)	3	1	96
L11	4	2	(309)	4	0	96	C	(428)	4	0	96
L12	4	2	(562)	4	0	96	C	(476)	2	0	98
L14	5	2	(134)	0	10	90	C	(177)	31	32	37
L19	4	2	(391)	1	0	99	C	(276)	3	0	97
L21	4	2	(382)	9	1	90	C	(487)	1	0	100
L31	3	1	(278)	10	0	90	C	(164)	0	0	100
			Model with noncontingent Sr+ (n = 7)								
L5	4	2	(215)	0	0	100	C	(150)	20	18	62
L13	3	1	(494)	1	0	99	C	(245)	0	0	100
L22	4	4	(480)	2	9	89	C	(453)	0	0	100
L24	3	2	(819)	6	1	93	C	(806)	2	1	97
L25	5	2	(458)	3	1	96	C	(500)	11	13	76
L29	3	4	(592)	0	0	100	C	(521)	15	0	85
L32	3	1	(715)	7	2	91	C	(429)	7	0	93

Note. R = response; EXT = extinction; $_a$ = the schedule of reinforcement on this lever was FR 5 during training.

Table 9

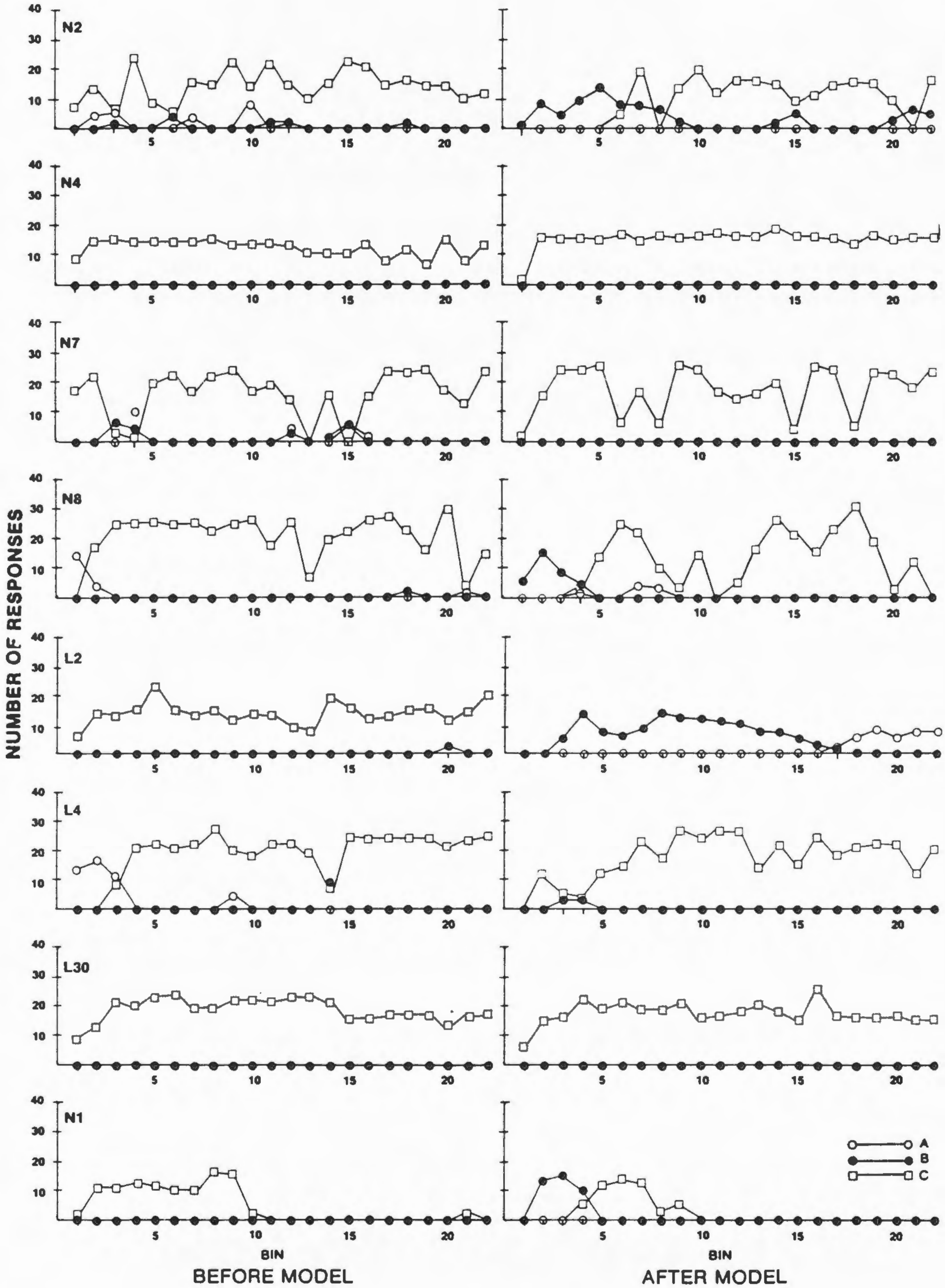
Means, Standard Deviations, and Correlated t Scores for Percentages of Responses on Lever B

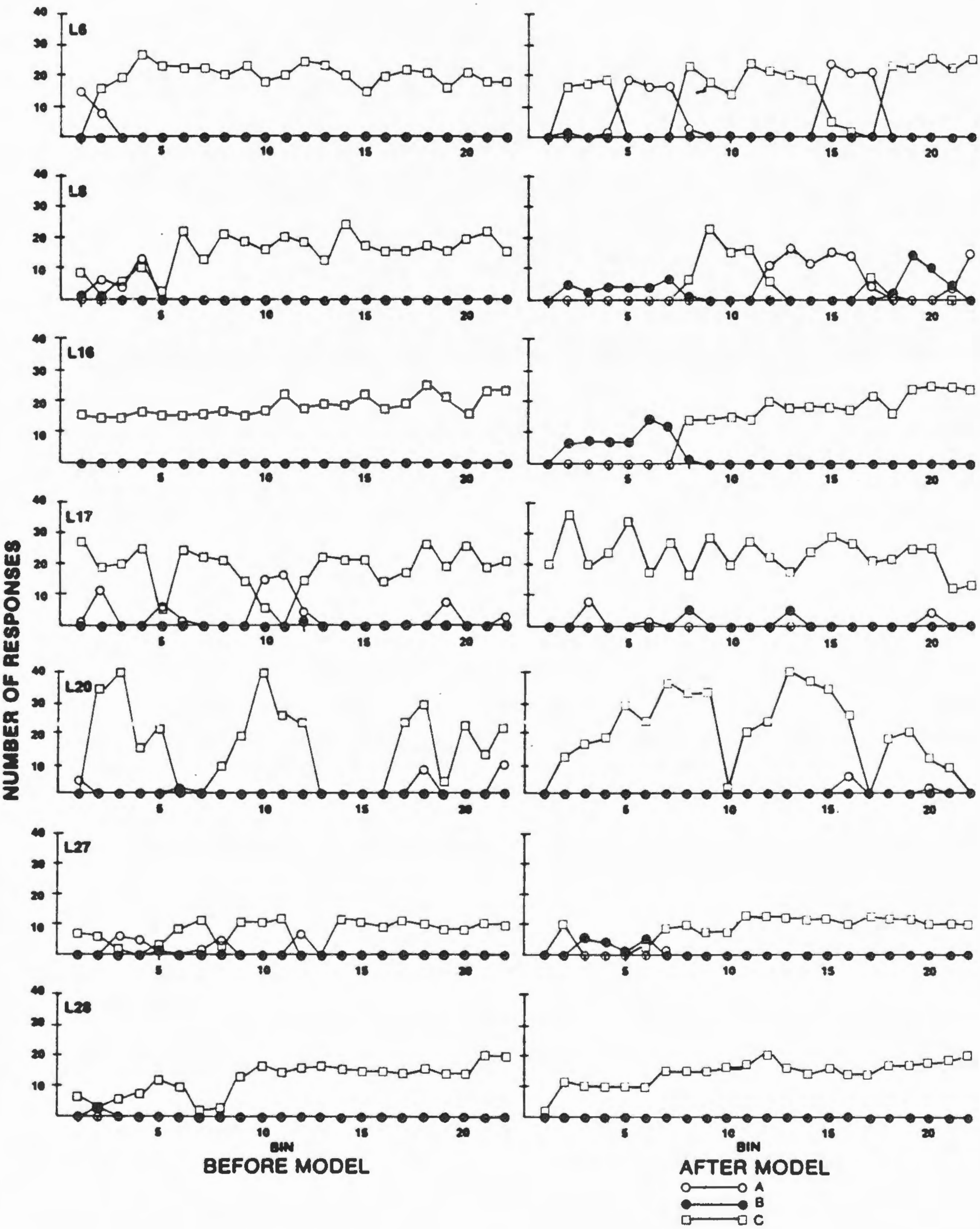
Condition	PRE		POST		*t*
	M	SD	M	SD	
Model with FR 5	1.41%	0.02	16.71%	0.28	-1.40
Model with FR 25	0.29%	0.01	7.77%	0.10	-1.99
Model without reinforcement	2.10%	0.03	4.71%	0.12	-0.82
Model with noncontingent reinforcement	1.74%	0.03	4.57%	0.08	-0.83

[a]n = 7 for each group; no *t* values significant at .05.

responding after approximately two minutes in both sessions. It was assumed that the tokens no longer functioned as reinforcers because they did not maintain or increase responding as they did in training, and his data were not included in the statistical analyses. Similar data are presented for the model-with-FR 25-reinforcement condition (Figure 6), the model-with-no-reinforcement condition (Figure 7), and the response-independent reinforcement condition (Figure 8). As in Figure 5, these figures illustrate that there was little or no responding on Lever A or B in the session before the model.

Figures 5 and 6 illustrate that only some subjects responded on the modeled lever (B) for the initial portion of the period following a reinforced model. This level of responding is less than the expected level given the results of Experiment I but is somewhat greater than the


NUMBER OF RESPONSES
N2
N4
N7
N8
L2
L4
L30
N1
A
B
C
BIN
BEFORE MODEL
AFTER MODEL

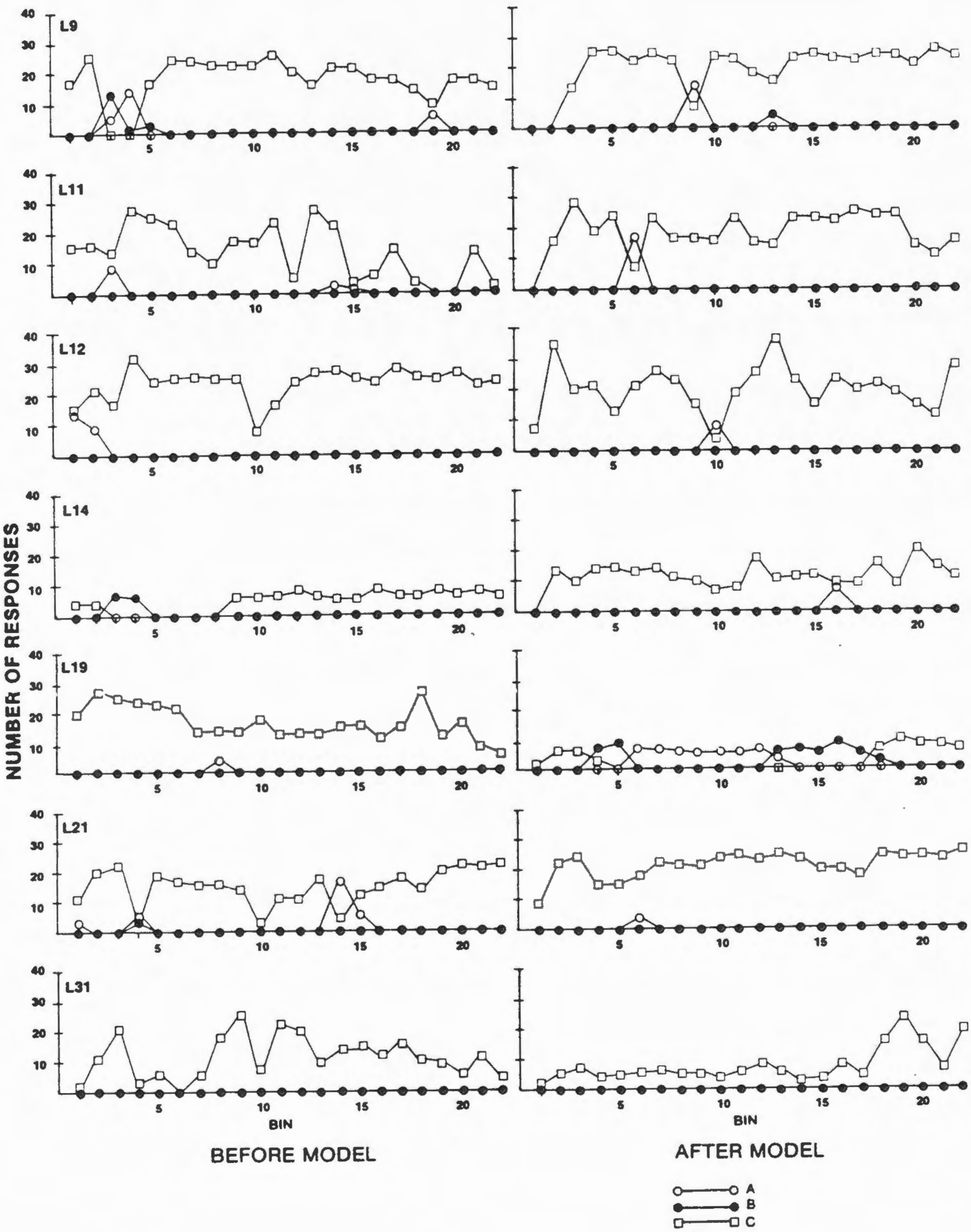

NUMBER OF RESPONSES
L6
L8
L16
L17
L20
L27
L28
BIN
BEFORE MODEL
AFTER MODEL
A
B
C

level of responding on Lever B in the control conditions (Figures 7 and 8). Figures 5 and 6 also illustrate that there were extinction effects for those subjects who followed the model (N1, N2, N8, L2, L8, L16, and L27).

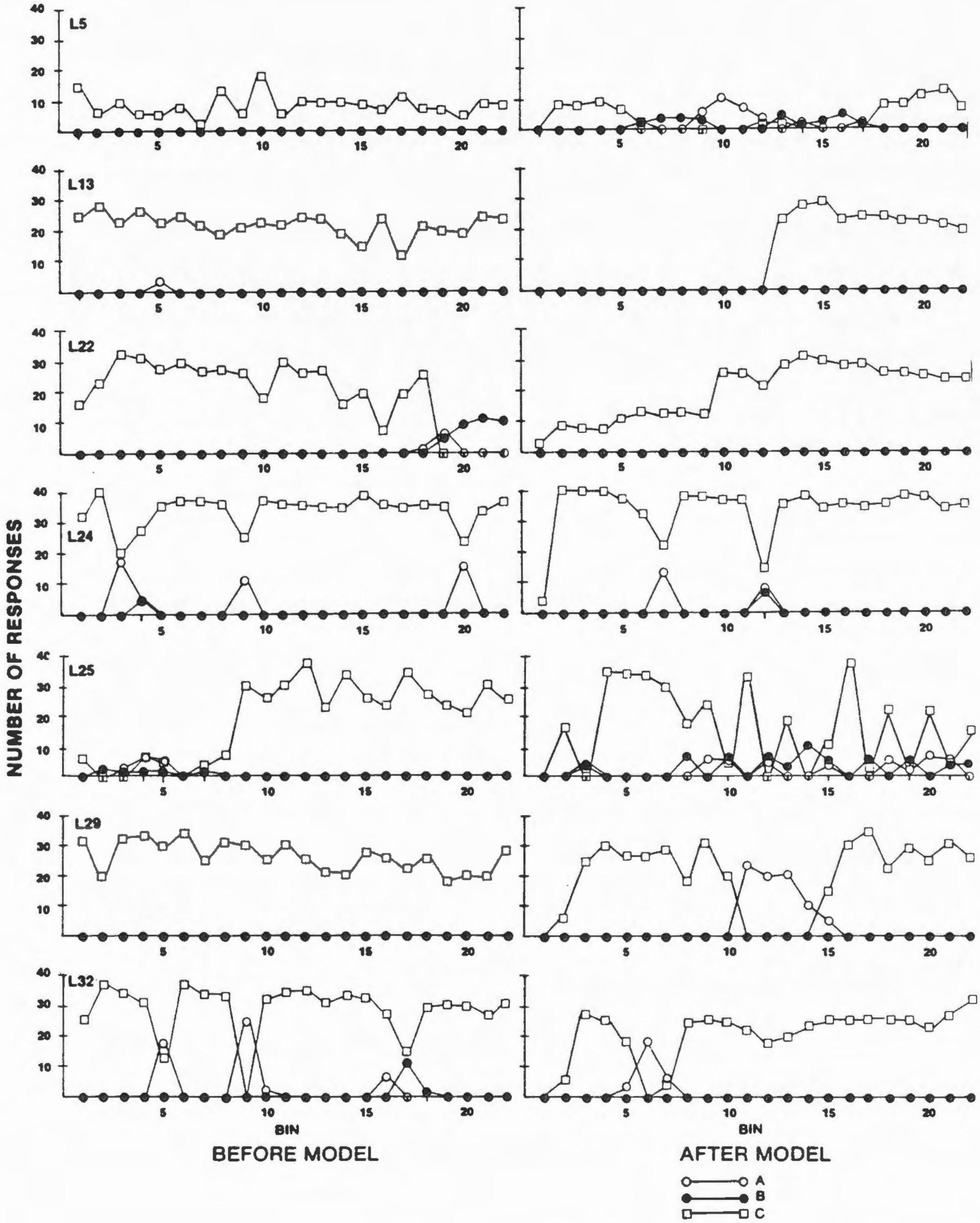
Figures 7 and 8 illustrate that subjects did not respond on Lever B after observing the model respond on that lever and receive no reinforcement (Figure 7) or when the model received response-independent reinforcement (Figure 8). However, the subjects in these conditions did respond rather consistently on Lever C. This was expected given that subjects responded almost exclusively on Lever C in the session before observing the model, and because subjects continued to be reinforced for responding on Lever C after the independent variable was introduced. However, periodic switching is noted for some subjects (e.g., L9, L11, L12). Figure 8 also shows that one subject (L13) did not respond on the levers for over two minutes, perhaps "imitating" the model who received response-independent reinforcement. As shown in Figure 8, subjects continued to respond as they did before the model condition despite the presence of reinforcement (albeit response independent). This result eliminated arousal, per se, as an explanation for the results in the response-dependent conditions (cf. Killeen, 1975).

Discussion

The hypothesis that subjects would follow the model and respond on Lever B when they observed the model receive reinforcement for responding on Lever B received little support under the conditions of Experiment II. Only subjects N1, N2, N8, L2, L6, L8, and L16 responded on Lever B in the initial portion of the post-modeling session (Figures



NUMBER OF RESPONSES
L9
L11
L12
L14
L19
L21
L31
40
30
20
10
5
10
15
20
BIN
BEFORE MODEL
AFTER MODEL
A
B
C


L5
L13
L22
L24
L25
L29
L32
NUMBER OF RESPONSES
BIN
BEFORE MODEL
AFTER MODEL
A
B
C

5 and 6), and although group means for responding on Lever B were higher for those groups who observed the model receive tokens (model with FR 5 and FR 25), the difference in means was not statistically significant (Table 9). Curiously, subject L13 "followed the model" and did not respond for more than two minutes after observing the model receive response-independent reinforcement (Figure 8).

Although several subjects did respond on the same lever as the model, some subjects who observed the model receive reinforcement did not respond on Lever B. Because all subjects had functionally equivalent experimental histories, other variables were assessed post hoc in an effort to account for the differential responding. One potential variable that may account for the results is the model. However, all subjects observed the same model, except for the Utah subjects (N1-N8), and visual inspection (Figures 5 and 6) revealed no differences between these subjects. Phillips et al. (1969a, 1969b) did not find increased imitation when models and subjects were of the same sex but found more imitation in female than in male subjects. The present study illustrates that male subjects will not necessarily follow a male model (e.g., N4, N7, L30) and that females will not necessarily follow a male model more than males do (e.g., L4, L28). Another possibility is that subjects' pre-experimental histories of imitating adults accounted for the results; however, this possibility is not available to inquiry.

Other additional variables that were assessed post hoc were the subjects' age and the number of extinction sessions prior to observing the model. Although the average age of the subjects who did not respond on Lever B after observing the model receive response-contingent reinforcement was slightly higher than those who did respond on Lever B (60 months vs. 56 months), there was no consistent finding of younger (i.e., four-year-old) children imitating the model more than older (i.e., five-year-old) children. This result is consistent with Levy et al. (1974), who found that children imitated more than adults but found no difference between children of different ages (e.g., preschool and second grade).

As indicated in Table 8, subjects who observed the model reinforced for responding on Lever B had between one and three extinction sessions before observing the model. The number of these extinction sessions did not discriminate between those subjects who responded on Lever B as opposed to Lever C. Therefore, this variable could not account for the results obtained.

It is interesting to note again that like Experiment Ib, responding on the model lever (B) was not sustained for the entire session (for those subjects who initially responded on Lever B) and only subject L2 sustained responding on Lever B for more than two minutes (the length of the extinction session in Experiment Ia and Ib). It appears that when vicarious reinforcement effects do occur under the conditions established in Experiment II, they are not long maintained. These results are consistent with what the extinction hypothesis would predict (Ollendick et al., 1983) because responding like the model was not maintained in the absence of direct reinforcement for the modeled response.

Vicarious reinforcement did not produce effects predicted by a discriminative stimulus interpretation (Kazdin, 1979). If vicarious reinforcement signals the general availability of reinforcement, subjects should have responded, at least initially, on Lever A, the response in which subjects had a history of reinforcement with a high-frequency schedule.

Having some reinforcement available (Lever C) during the extinction session did eliminate emotional behavior in Experiment II. However, having direct reinforcement available may have confounded vicarious reinforcement effects as the post-modeling session progressed by artificially suppressing responding on Lever B. Unlike Experiment Ia and Ib, extinction was functional in that most subjects performed over 200 responses on Levers A and B, respectively, during the training phase but performed very few responses on these levers in the session prior to observing the model. Also, subjects' almost exclusive preference for Lever C (Table 8) in the premodeling sessions demonstrated that the tokens maintained responding and were functional reinforcers. This preference for Lever C was maintained in the final session, especially for those subjects in the model-with-no-reinforcement and response-independent reinforcement conditions (Table 8, Figures 7 and 8).

One other variable assessed in Experiment II was the reinforcement schedule for the model. There appeared to be little difference between the high-frequency (FR 5) and low-frequency (FR 25) reinforcement schedules, although the FR 5 group did have a higher group mean of responding on the modeled lever (Table 9).

In summary, unlike Experiment Ib, the social learning interpretation of vicarious reinforcement (Bandura, 1977) received little support given the procedures in Experiment II. Like Experiment Ib, however, the extinction hypothesis (Ollendick et al., 1983) received some support and the discriminative stimulus interpretation (Kazdin,

1979) received little or no support.

GENERAL DISCUSSION

The results of the previous experiments provide a measure of support for the social learning interpretation of vicarious reinforcement (Bandura, 1977). However, procedural differences between the two experiments highlight how history of the observer and extended periods of no direct reinforcement for the modeled response define limits to this theoretical account. The results of the present study also provide guidelines that should be useful for implementing vicarious reinforcement in the applied setting.

Theoretical Accounts

Social learning theory (Bandura, 1977) predicts that observing a model receive reinforcement "motivates" the observer to perform responses similar to the model. This prediction was unequivocally supported in Experiment Ib because only those subjects who observed the model receive reinforcement for responding on Lever D followed the model. However, only 7 of the 15 subjects who observed the model receive response-contingent reinforcement in Experiment II followed the model. One apparently critical difference between the two experiments was that the subjects in Experiment II had an extensive history of responding on the modeled Lever (B) during the training phase and were never reinforced for this response. Using different procedures in a generalized imitation study, Draper (1976/1977) also demonstrated that the experimental history of the subject was a critical variable in following the model. He showed that subjects will cease emitting unreinforced imitative responses if the subject observes a model emit a behavior that is reinforced and the subject does not have this response in his/her behavioral history. This result was similar to a result in Experiment Ib because subjects had little or no history on Lever D before observing the model emit a reinforced response. Draper (1976/1977) also found that if subjects observed an adult model emit an unreinforced imitative response but the subject's history and current environment contained a reinforced alternative, the subject was unlikely to emit the model's response. This result was similar to the effects found in the model-with-no-reinforcement condition in Experiment II (Figure 6). All subjects responded predominately on Lever C, the reinforced alternative, after observing the model respond on Lever B and receive no reinforcement. This group also demonstrated the strong effect of an experimental history because one would expect that some subjects' pre-experimental histories would lead them to imitate an adult in the absence of reinforcement. The results of the present study, therefore, extend the finding that history is a critical variable not only in generalized imitation studies (e.g., Draper, 1976/1977; Oliver et al., 1977) but also in vicarious reinforcement studies where one of the model's responses is reinforced.

The support for the social learning interpretation of vicarious reinforcement is noteworthy given the earlier discussion of controlling for some of the variables associated with increased imitation (e.g., nonalternate-trial design, presence of the examiner, history with the model, etc.). However, the Ollendick et al. (1983) hypothesis is a useful corollary for the social learning interpretation. Although Ollendick and his colleagues demonstrated that vicarious reinforcement "motivates" the observer to perform like the model, it "motivates" the subject for only a short amount of time, and direct reinforcement is eventually required to maintain responding on the modeled lever. This hypothesis is consistent with the results of the present studies (Figures 2, 5, and 6), although direct reinforcement on the modeled lever was never available for the subjects in the present studies. The effect of direct reinforcement on the modeled lever, given the conditions in the present experiments, is an area for future investigation.

Recall that Ollendick et al. (1982) utilized the experimental task of puzzle completion and that praise was given to one member of the dyad by the examiner. The dyad and the procedure of praising only one member of the dyad were also used in Ollendick et al. (1983) and Ollendick and Shapiro (1984). However, Bandura (1971b) distinguished between this implicit punishment procedure and a vicarious reinforcement procedure where observers do not perform any modeled responses during the modeling period. Experiment II (and, to some extent, Experiment I) illustrates a vicarious reinforcement extinction effect similar to Ollendick and his colleagues but in a situation that is a vicarious reinforcement procedure as defined by Bandura. In addition, the extinction effects found in the present studies occurred in the absence of the examiner and with a functional, tangible reinforcer.

The discriminative stimulus interpretation of vicarious reinforcement received virtually no support from the present experiments. One can speculate that the nature of the reinforcers used in the present experiments (i.e., tangible) and the experimental history provided for each subject were dissimilar from the applied studies that supported the discriminative stimulus interpretation and accounted for the lack of support. Additionally, the nature of the modeled behavior in some of the applied studies (i.e., inattentive behavior in Kazdin, 1973b, 1977) may not have been discriminable for the observer or at least as discriminable as discrete lever responses. It is also possible that the discriminative stimulus (i.e., vicarious reinforcement) needs several pairings with the reinforced "nonmodeled" response before it controls responding. This is also an area for future research.

An examination of the studies conducted in an applied setting (e.g., classroom) that were supportive of a discriminative stimulus interpretation revealed that social approval was used almost exclusively as the reinforcer (Kazdin, 1973a, 1973b, 1977; Werstlein, 1978), and the modeled behavior was usually attentive or inattentive behavior (Kazdin, 1973b, 1977), work rate (Kazdin, 1973a), or academic performance (Werstlein, 1978). Also, most of the above-cited studies used dyads where only one "target" subject was directly reinforced. The usual procedure entailed measuring attentive behavior in the following phases: baseline, reinforcement of attentive behavior, baseline, and reinforcement of inattentive behavior. The interesting data occurred in the final phase, where praise delivered to the model or the "target" subject for inattentive behavior lead to increased attentive behavior in the observer. It would be interesting to assess in a classroom setting whether similar effects would occur if the observer could not engage in the reinforced behavior until after he/she observed the model perform. This procedure would more closely approximate Bandura's definition of vicarious reinforcement and increases the likelihood that the observer was attending to the behavior of the model. This procedure would be, to some extent, an extension of the present studies to the classroom setting.

In summary, vicarious reinforcement appears to increase the likelihood that an observer will imitate a model, temporarily, if the model is reinforced and if the subject has little or no history of not receiving reinforcement for the modeled response. In the present case, a shortened duration of responding on the modeled lever could also have been affected by the continued availability of reinforcement for responding on an alternate lever.

Implications for the Applied Setting

The previous discussion implies that those who plan to use vicarious reinforcement in an applied setting should be aware of its limitations.

One use of vicarious reinforcement may be in teaching new behavior. It would appear from the results of the present experiments that vicarious reinforcement can be an effective tool to teach new behavior provided the behavior is novel for the observer. The effectiveness of vicarious reinforcement is less clear when the observer has a history of performing the modeled response and never being directly reinforced for it.

The usefulness of vicarious reinforcement in teaching new behavior is also dependent upon the procedure used in the applied setting. The results of the present experiments and the previous discussion suggest that it may be better to have the observer attend to the model's behavior and then perform the response instead of simultaneously performing the response and receiving no direct reinforcement.

Another implication for the applied setting is that vicarious reinforcement effects are temporary. This supports the notion that direct reinforcement is crucial for the observer to maintain responding after he/she has imitated the model's behavior. This is evident by the results of the present studies, which illustrate that responding on the modeled lever will decrease and eventually cease in the absence of direct reinforcement, and by Ollendick et al. (1983), who demonstrated that the detrimental effects of directly reinforcing only the model's behavior can be reversed by directly reinforcing the observer's behavior.

A third implication that was addressed on a limited basis in the present experiments is that a high-frequency reinforcement schedule for the model may have nominal effects in motivating the observer to perform like the model. This result does not support earlier studies that found greater resistance to extinction when models were reinforced on a low-frequency reinforcement schedule (e.g., Hamilton, 1970; Lewis & Duncan, 1958; Paulus & Seta, 1975). However, the rather short exposure to the model in the present studies may have accounted for the difference from the earlier studies and the lack of increased responding on Lever B in the model-with-FR 25-reinforcement condition.

Although vicarious reinforcement can be an effective tool in teaching new behavior in a classroom or clinic setting, the various contingencies of direct reinforcement and the histories of the observers relative to the models are important considerations. An extension of the present studies to these applied settings in order to investigate these variables more definitively than the previous research is an area for future work.

REFERENCES

Akamatsu, T. J., & Thelen, M. H. (1971). The acquisition and performance of a socially neutral response as a function of vicarious reward. Developmental Psychology, 5, 440-445.

Akamatsu, T. J., & Thelen, M. H. (1974). A review of the literature on observer characteristics and imitation. Developmental Psychology, 10, 38-47.

Allen, M. K., & Liebert, R. M. (1969). Effects of live and symbolic deviant-modeling cues on adoption of a previously learned standard. Journal of Personality and Social Psychology, 11, 253-260.

Allport, F. H. (1924). Social psychology. Cambridge, MA: Houghton Mifflin.

Anderson, E. G. (1980). The use of symbolic modeling on generalized imitation in children (Doctoral dissertation, Utah State University, 1979). Dissertation Abstracts International, 41, 1156B.

Arenson, S. J. (1976). Vicarious conditioned reinforcement in children. Journal of Psychology, 94, 65-71.

Baer, D. M., Peterson, R. F., & Sherman, J. A. (1967). The development of imitation by reinforcing behavioral similarity to a model. Journal of the Experimental Analysis of Behavior, 10, 405-416.

Baer, D. M., & Sherman, J. A. (1964). Reinforcement control of generalized imitation in young children. Journal of Experimental Child Psychology, 1, 37-49.

Bandura, A. (1962). Social learning through imitation. In M. R. Jones (Ed.), Nebraska symposium on motivation (Vol. 10, pp. 211-269). Lincoln: University of Nebraska Press.

Bandura, A. (1965). Influence of models' reinforcement contingencies on the acquisition of imitative responses. Journal of Personality and Social Psychology, 1, 589-595.

Bandura, A. (1969). Principles of behavior modification. New York: Holt, Rinehart, & Winston.

Bandura, A. (1971a). Analysis of modeling processes. In A. Bandura (Ed.), Psychological modeling: Conflicting theories (pp. 1-62). Chicago: Aldine Atherton.

Bandura, A. (1971b). Vicarious and self-reinforcement processes. In R. Glaser (Ed.), The nature of reinforcement (pp. 228-278). New York: Academic Press.

Bandura, A. (1977). Social learning theory. Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A., Grusec, J. E., & Menlove, F. L. (1967). Some determinants of self-monitoring reinforcement systems. Journal of Personality and Social Psychology, 5, 449-455.

Bandura, A., Ross, D., & Ross, S. A. (1963). Vicarious reinforcement and imitative learning. Journal of Abnormal and Social Psychology, 67, 601-607.

Berger, S. M. (1961). Incidental learning through vicarious reinforcement. Psychological Reports, 9, 477-491.

Berger, S. M. (1971). Observer perseverance as related to a model's success: A social comparison analysis. Journal of Personality and Social Psychology, 19, 341-350.

Berger, S. M., & Johansson, S. L. (1968). Effect of a model's expressed emotions on an observer's resistance to extinction. Journal of Personality and Social Psychology, 10, 53-58.

Bijou, S. W., & Baer, D. M. (1961). Child development: A systematic and empirical theory (Vol. 1). Englewood Cliffs, NJ: Prentice-Hall.

Borden, B. L. (1974). Resistance to extinction as a function of schedules of direct or vicarious reinforcement and amount of acquisition training (Doctoral dissertation, University of Arizona, 1973). Dissertation Abstracts International, 34, 4033B-4034B.

Braun, S. H. (1972). Effects of schedules of direct or vicarious reinforcement and modeling cues on behavior in extinction. Journal of Personality and Social Psychology, 22, 356-365.

Bruning, J. L. (1965). Direct and vicarious effects of a shift in magnitude of reward on performance. Journal of Personality and Social Psychology, 2, 278-282.

Bufford, R. K. (1971). Discrimination and instructions as factors in the control of nonreinforced imitation. Journal of Experimental Child Psychology, 12, 35-50.

Catania, A. C. (1966). Concurrent operants. In W. K. Honig (Ed.), Operant behavior: Areas of research and application (pp. 213-270). New York: Appleton-Century-Crofts.

Clark, B. S. (1965). The acquisition and extinction of peer imitation in children. Psychonomic Science, 2, 147-148.

Crossman, E. K. (1984). An inexpensive operant chamber interface for the VIC-20 microcomputer. Behavior Research Methods, Instruments, and Computers, 16, 338-340.

Ditrichs, R., Simon, S., & Greene, B. (1967). Effects of vicarious scheduling on the verbal conditioning of hostility in children. Journal of Personality and Social Psychology, 6, 71-78.

Draper, J. S. (1977). Provision of an experimental history and its effects on generalized imitation in children in a situation controlled for social variables (Doctoral dissertation, Utah State University, 1976). Dissertation Abstracts International, 37, 5395B.

Dubanoski, R. A. (1967). Imitation as a function of role appropriateness of behavior and response consequences to the model. Dissertation Abstracts, 27, 2613A-2614A.

Durrell, D. E., & Weisberg, P. (1975). Imitative play behavior of children: The importance of model distinctiveness and prior imitative training. Journal of Experimental Child Psychology, 16, 23-31.

Elliott, R., & Vasta, R. (1970). The modeling of sharing: Effects associated with vicarious reinforcement, symbolization, age, and generalization. Journal of Experimental Child Psychology, 10, 8-15.

Epstein, R. (1983). Resurgence of previously reinforced behavior during extinction. Behaviour Analysis Letters, 3, 391-397.

Feist, J. R. (1975). Some determinants of resistance to extinction in vicarious reinforcement (Doctoral dissertation, University of Arizona, 1974). Dissertation Abstracts International, 35, 6127B.

Ferguson, G. A. (1981). Statistical analysis in psychology and education (5th ed.). New York: McGraw-Hill.

Finch, A. J., Lloyd, A., Frerking, R. A., & Rickard, H. C. (1973). Model's competency, vicarious reinforcement, and subject's strategy in imitative performance. Psychological Reports, 32, 442.

Fisher, J. L., & Harris, M. B. (1976). The effect of three model characteristics on imitation and learning. The Journal of Social Psychology, 98, 183-199.

Flanders, J. P. (1968). A review of research on imitative behavior. Psychological Bulletin, 69, 316-337.

Flanders, J. P., & Thistlewaite, D. L. (1970). Effects of informative and justificatory variables upon imitation. Journal of Experimental Social Psychology, 6, 316-328.

Garrett, C. S., & Cunningham, D. J. (1974). Effects of vicarious consequences and model and experimenter sex on imitative behavior in first grade children. Journal of Educational Psychology, 66, 940-947.

Gewirtz, J. L. (1971). The roles of overt responding and extrinsic reinforcement in "self-" and "vicarious-reinforcement" phenomena and in "observational learning" and imitation. In R. Glaser (Ed.), The nature of reinforcement (pp. 279-309). New York: Academic Press.

Gewirtz, J. L., & Stingle, K. G. (1968). The learning of generalized imitation as the basis for identification. Psychological Review, 75, 374-397.

Grossman, F. M. (1978). Vicarious consequences and the observer characteristics of grade and sex: An informational analysis of imitation (Doctoral dissertation, University of Nebraska, Lincoln, 1977). Dissertation Abstracts International, 38, 6238B.

Hamilton, D. L., Thompson, J. J., & White, A. M. (1970). Role of awareness and intentions in observational learning. Journal of Personality and Social Psychology, 16, 689-694.

Hamilton, M. L. (1970). Vicarious reinforcement effects on extinction. Journal of Experimental Child Psychology, 9, 108-114.

Holt, E. B. (1931). Animal drive and the learning process (Vol 1). New York: Holt.

Humphreys, L. G. (1921). Imitation and the conditioned reflex. Pedagogical Seminary, 28, 1-21.

Jersild, A. T. (1933). Child psychology. New York: Prentice-Hall.

Kanfer, F. H. (1965). Vicarious human reinforcement: A glimpse into the black box. In L. Krasner & L. P. Ullmann (Eds.), Research in behavior modification (pp. 244-267). New York: Holt, Rinehart, & Winston.

Kanfer, F. H., & Marston, A. R. (1963). Human reinforcement: Vicarious and direct. Journal of Experimental Psychology, 65, 292-296.

Kazdin, A. (1973a). The effect of vicarious reinforcement on performance in a rehabilitation setting. Education and Training of the Mentally Retarded, 8, 4-11.

Kazdin, A. E. (1973b). The effect of vicarious reinforcement on attentive behavior in the classroom. Journal of Applied Behavior Analysis, 6, 71-78.

Kazdin, A. E. (1977). Vicarious reinforcement and direction of behavior change in the classroom. Behavior Therapy, 8, 57-63.

Kazdin, A. E. (1979). Vicarious reinforcement and punishment in operant programs for children. Child Behavior Therapy, 1, 13-36.

Kelly, R. (1966). Comparison effects of positive and negative vicarious reinforcement in an operant learning task. Journal of Educational Psychology, 57, 307-310.

Killeen, P. (1975). On the temporal control of behavior. Psychological Review, 82, 89-115.

Kuznicki, J. T., & Greenfeld, N. (1977). Vicarious and direct reinforcement: An experimental evaluation. Journal of Social Psychology, 101, 103-111.

Levy, E. A., McClinton, B. S., Rabinowitz, F. M., & Wolkin, J. R. (1974). Effects of vicarious consequences on imitation and recall: Some developmental findings. Journal of Experimental Child Psychology, 17, 115-132.

Lewis, D. J., & Duncan, C. P. (1958). Vicarious experience and partial reinforcement. Journal of Abnormal and Social Psychology, 57, 321-326.

Liebert, R. M., & Fernandez, L. E. (1970a). Effects of vicarious consequences on imitative performance. Child Development, 41, 847-852.

Liebert, R. M., & Fernandez, L. E. (1970b). Imitation as a function of vicarious direct reward. Developmental Psychology, 2, 230-232.

Liebert, R. M., Sobol, M. P., & Copeman, C. D. (1972). Effects of vicarious consequences and race of model upon imitative performance by black children. Developmental Psychology, 6, 453-456.

Lyons, V. M., & Levine, S. M. (1978). Correlation between responsiveness to information and vicarious learning. Perceptual and Motor Skills, 47, 467-474.

Marlatt, G. A. (1970). A comparison of vicarious and direct reinforcement control of verbal behavior in an interview setting. Journal of Personality and Social Psychology, 16, 695-703.

Marlatt, G. A., Jacobson, E. A., Johnson, D. L., & Morrice, D. J. (1970). Effect of exposure to a model receiving evaluative feedback upon subsequent behavior in an interview. Journal of Consulting and Clinical Psychology, 34, 104-112.

Marlowe, D., Breecher, R. S., Cook, J. B., & Doob, A. N. (1964). The approval motive, vicarious reinforcement, and verbal conditioning. Perceptual and Motor Skills, 19, 523-530.

Marston, A. R. (1964). Variables in extinction following acquisition with vicarious reinforcement. Journal of Experimental Psychology, 68, 312-315.

Marston, A. R. (1965). Imitation, self-reinforcement, and reinforcement of another person. Journal of Personality and Social Psychology, 2, 255-261.

Marston, A. R. (1966). Determinants of the effects of vicarious reinforcement. Journal of Experimental Psychology, 71, 550-558.

Martin, J. A. (1971). The control of imitative and nonimitative behaviors in severely retarded children through "generalized-instruction following." Journal of Experimental Child Psychology, 11, 390-400.

Martin, J. A. (1972). The effect of incongruent instructions and consequences on imitation in retarded children. Journal of Applied Behavior Analysis, 5, 467-475.

McDougall, W. (1908). Introduction to social psychology. Boston: J. W. Luce.

McGinley, H. (1970). The development of a conditioned reinforcer through direct and vicarious reinforcement. Journal of Experimental Social Psychology, 6, 364-377.

Miller, N. E., & Dollard, J. (1941). Social learning and imitation. New Haven: Yale University Press.

Oliver, P. R., Acker, L. E., & Oliver, D. D. (1977). Effects of reinforcement histories of compliance and noncompliance on nonreinforced imitation. Journal of Experimental Child Psychology, 23, 180-190.

Ollendick, T. H., Dailey, D., & Shapiro, E. S. (1983). Vicarious reinforcement: Expected and unexpected effects. Journal of Applied Behavior Analysis, 16, 485-491.

Ollendick, T. H., & Shapiro, E. S. (1984). An examination of vicarious reinforcement processes in children. Journal of Experimental Child Psychology, 37, 78-91.

Ollendick, T. H., Shapiro, E. S., & Barrett, R. P. (1982). Effects of vicarious reinforcement in normal and severely disturbed children. Journal of Consulting and Clinical Psychology, 50, 63-70.

Osborne, J. G., & Duus, R. (1979). Antecedent control of generalized symbolic matching by children. Unpublished manuscript, Utah State University.

Paschke, R. E., Simon, S., & Bell, R. W. (1967). Vicarious discrimination learning in retardates. Journal of Abnormal Psychology, 72, 536-542.

Paulus, P. B., & Seta, J. J. (1975). The vicarious partial reinforcement effect: An empirical and theoretical analysis. Journal of Personality and Social Psychology, 31, 930-936.

Peterson, R. F. (1968). Some experiments on the organization of a class of imitative behaviors. Journal of Applied Behavior Analysis, 1, 225-235.

Peterson, R. F., & Whitehurst, G. J. (1971). A variable influencing the performance of generalized imitative behaviors. Journal of Applied Behavior Analysis, 4, 1-9.

Phillips, R. E. (1968a). Comparison of direct and vicarious reinforcement and an investigation of methodological variables. Journal of Experimental Psychology, 78, 666-669.

Phillips, R. E. (1968b). Vicarious reinforcement and imitation in a verbal learning situation. Journal of Experimental Psychology, 76, 669-670.

Phillips, R. E. (1969). Effect of noncontingent vicarious reinforcement on verbal learning in a group situation. Psychological Reports, 25, 7-10.

Phillips, R. E., Bentson, S. B., & Blaney, P. H. (1969a). Direct reinforcement, sex of model, sex of subject, and learning by vicarious reinforcement. Psychonomic Science, 17, 325-326.

Phillips, R. E., Bentson, S. B., & Blaney, P. H. (1969b). The effects of direct reinforcement, sex of model, and sex of subject on verbal learning by vicarious reinforcement. Proceedings from the 77th Annual Convention of the American Psychological Association, 4, 65-66.

Rice, M. E. (1976). The development of responsiveness to vicarious reinforcement. Developmental Psychology, 12, 540-545.

Rickard, H. C., & Lattal, K. A. (1967). Model similarity and observer learning. Psychological Reports, 21, 501-506.

Rosekrans, M. A. (1967). Imitation in children as a function of perceived similarity to a social model and vicarious reinforcement. Journal of Personality and Social Psychology, 7, 307-315.

Rosenbaum, M. E., & Bruning, J. L. (1966). Direct and vicarious effects of variations in percentage of reinforcement on performance. Child Development, 37, 959-966.

Sechrest, L. (1963). Implicit reinforcement of responses. Journal of Educational Psychology, 54, 197-201.

Skinner, B. F. (1953). Science and human behavior. New York: Free Press.

Steinman, W. M. (1970a). Generalized imitation and the discrimination hypothesis. Journal of Experimental Child Psychology, 10, 79-99.

Steinman, W. M. (1970b). The social control of generalized imitation. Journal of Applied Behavior Analysis, 3, 159-167.

Steinman, W. M., & Boyce, K. D. (1971). Generalized imitation as a function of discrimination difficulty and choice. Journal of Experimental Child Psychology, 11, 251-265.

Tarde, G. (1903). The laws of imitation. New York: Holt.

Thelen, M. H. (1969). The modeling of verbal reactions to failure. Developmental Psychology, 1, 297.

Thelen, M. H., & Rennie, D. L. (1972). The effect of vicarious reinforcement on imitation: A review of the literature. In B. A. Maher (Ed.), Progress in experimental personality research (Vol. 6, pp. 83-108). New York: Academic Press.

Thelen, M. H., & Soltz, W. (1969). The effect of vicarious reinforcement on imitation in two social-racial groups. Child Development, 40, 879-888.

Turner, S. M., & Forehand, R. (1976). Effects of subject characteristics, experimenter-model characteristics, and vicarious praise on imitative learning. _Psychological Record_, _26_, 435-440.

Walters, R. H., & Parke, R. D. (1964). Influences of response consequences to a social model on resistance to deviation. _Journal of Experimental Child Psychology_, _1_, 269-280.

Walters, R. H., Parke, R. D., & Cane, V. A. (1965). Timing of punishment and the observation of consequences to others as determinants of response inhibition. _Journal of Experimental Child Psychology_, _2_, 10-30.

Waxler, C. Z., & Yarrow, M. R. (1970). Factors influencing imitative learning in preschool children. _Journal of Experimental Child Psychology_, _9_, 115-130.

Weiner, H. (1966). Preference and switching under ratio contingencies with humans. _Psychological Reports_, _18_, 239-246.

Weiner, H. (1967). Cost to payoff contributions to preference under fixed-ratio contingencies with humans. _Psychological Reports_, _20_, 31-35.

Werstlein, R. C. (1978). Effects of type and history of reinforcement on magnitude of vicarious reinforcement (Doctoral dissertation, Auburn University, 1978). _Dissertation Abstracts International_, _39_, 2532B.

Whitehurst, G. J. (1978). Observational learning. In A. C. Catania & T. A. Brigham (Eds.), _Handbook of applied behavior analysis_ (pp. 142-178). New York: Irvington.

Woodworth, R. S., & Schlosberg, H. (1954). _Experimental psychology_ (rev. ed.). New York: Holt, Rinehart, & Winston.

Yando, R., Seitz, V., & Zigler, E. (1978). Imitation: A developmental perspective. New York: Erlbaum.

FOOTNOTES

[1]Although the tokens were Mexican five centavos coins, they were called "pennies" when talking to the subjects for simplicity.

[2]Ferguson (1981) noted that the analysis of variance and the nondirectional *t*-tests were not seriously affected when reasonable departures from the assumptions of normality and homogeneity occurred. He also noted that an arcsin transformation may be used to more closely conform with the assumptions when the experimental data are proportions. In the present experiments, results that are based on original data are presented because several additional analyses using transformed data did not change the statistical significance of the results.

VITA

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Doctor of Philosophy

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Publications:

Hurlburt, R. T., Lech, B. C., & Saltman, S. (1984). Random sampling of thought and mood. Cognitive Therapy and Research, 8, 263-275.

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Presentations:

Knapp, T. J., & Lech, B. C. The pencil experiment. A video presentation at the meeting of the Association for Behavior Analysis, Dearborn, Michigan, June 1979.

Knapp, T. J., & Lech, B. C. Pathological gambling: A review and critique. Paper presented at the meeting of the National Conference on Gambling and Risk-Taking, South Lake Tahoe, Nevada, October 1981.

Lech, B. C., & Ascione, F. R. Different formulas for computing observer agreement: Does it really make a difference? In F. Ascione (Chair), Some current dimensions of behavior assessment of children: Observational methods and training. Symposium presented at the meeting of the Rocky Mountain Psychological Association, Denver, Colorado, April 1981.

Lech, B. C., & Hurlburt, R. T. Immediate vs. delayed ratings of thoughts sampled during Annie Hall. Poster presented at the meeting of the Western Psychological Association, San Francisco, California, April 1983.

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